
**COGNITIVE ANXIETY LEVELS OF FIRST-TIME HEARING
AID USERS
AND THEIR SIGNIFICANT OTHERS
THROUGHOUT THE CONSULTATION PROCESS**

A thesis submitted in partial fulfilment of the
requirements for the Degree of Master of Audiology at
the University of Canterbury

by

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2013

Acknowledgements

Firstly, I would like to sincerely thank my primary supervisor, Dr. Rebecca Kelly-Campbell, for her endless support and advice throughout this process. Thank you for sparking my interest in this area of research and thank you for the many hours and weekends you dedicated helping me to get this thesis submitted on time. I would also like to thank my secondary supervisor, Dr. Don Sinex, for proof-reading this thesis.

I wish to thank and acknowledge the participants who willingly gave their time to take part in this study. Without them this thesis would have not been possible. Thank you very much to the audiologists and administrative staff at the clinics that were involved in the study. Many thanks goes to my fellow classmates, it's been in honor training with you. A special thanks goes to Dianne and Lucia. Thank you both for your friendship and all the good times we had together at the student house, you have saved my sanity.

I would also like to thank John Robertson for giving me an opportunity when no one else did. I am honored to be part of the team at Hearing Technology.

On a more personal note, I would like to thank my parents for their never-ending love, support and encouragement throughout my life. I would like to thank them for giving me the opportunity to pursue a profession that I am passionate about; an opportunity they never had. This thesis is dedicated to my dad, Norbert Wendel, who dedicated his life looking after his sick wife. I have the upmost respect for what you do, and even though I am not with you at the moment my thoughts are with you every minute of every day. I am so proud and privileged to have you as my dad.

Last but not least, I would like to thank my wonderful partner Simon. There are no words in the world that could express how much you mean to me. I owe this all to you.

Thank you for your never-ending support and encouragement. You are the kindest person I have ever met and I feel blessed to have you in my life.

Abstract

The primary aim of this study was to compare levels of cognitive anxiety for a group of first-time hearing aid users and their significant other before, during, and after hearing aid fitting. Secondary goals included: (1) comparing levels of cognitive anxiety for participants and their significant others at the same intervals, (2) assessing possible effects of gender on the experience of cognitive anxiety, (3) comparing the levels of cognitive anxiety for participants who adopted hearing aids and those that did not, and (4) identifying themes relating to the experience of hearing impairment and consultation for services. Thirty-nine adults between the ages of 30 and 87 years of age with and without hearing impairments participated in several interviews. Cognitive anxiety was measured using the Cognitive Anxiety Scale (CAS) by Viney & Westbrook (1976), which is a content analysis, grounded in personal construct psychology. The following research questions have been addressed:

1a) Do cognitive anxiety levels change in individuals with hearing impairment as they go through the consultation process? 1b) Is there any difference in cognitive anxiety levels between male and female participants with hearing impairment as they go through the consultation process? 2a) Do cognitive anxiety levels change in normal hearing significant others of individuals with hearing impairment as they go through the consultation process? 2b) Is there any difference in cognitive anxiety levels between male and female significant others as they go through the consultation process? 3a) Do cognitive anxiety levels differ between participants with hearing impairment who adopt amplification and those who do not? 3b) Do cognitive anxiety levels of significant others differ between participants with hearing impairment who adopt amplification and those who do not?

Results revealed reduced cognitive anxiety levels for hearing impaired adults between the first interview and third interview, between the second interview and third interview, but

no significant difference was found between the first interview and second interview. Furthermore, for significant others, CAS scores were significantly higher at interview 2 compared to interview 3, but no significant difference was found between interview 1 and interview 3, or between interview 1 and interview 2. Additionally, no significant differences in levels of cognitive anxiety were found between hearing impaired adults and significant others in the adopter and non-adopter group, and no gender differences were observed between hearing impaired adults and significant others. This study illustrates how important it is to involve the significant other in the consultation progress. However, due to a small sample size most analyses were underpowered therefore more research is needed to investigate cognitive anxiety levels in hearing impaired adults and their significant others.

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List of Abbreviations

Terms

CAS	Cognitive Anxiety Score
HI	Hearing Impairment
SOs	Significant Others
CA	Cognitive Anxiety
HIA	Hearing Impaired Adults
BM	Basilar Membrane
WHO	World Health Organization
CHI	Conductive Hearing Impairment
SNHI	Sensorineural Hearing Impairment
PTA	Pure-tone Average
USA	United States of America
ICF	The International Classification of Functioning, Disability and Health
QoL	Quality of Life
ARHI	Age Related Hearing Impairment
NIHI	Noise-Induced Hearing Impairment
HA	Hearing Aid
HRQoL	Health Related Quality of Life
HATS	Hearing Assistive Technology Systems
FM	Frequency Modulation
SNR	Signal to Noise Ratio
AR	Aural Rehabilitation
AT	Auditory Training
SOS-HEAR	Significant Other Scale for Hearing Disability

HII-SOP	The Hearing Impairment Impact-Significant Other Profile
LOC	Locus of Control
CID	chronic illness and disability (CID)
PCT	Personal Construct Theory
PTA4	Pure-tone average at 4 frequencies (500Hz, 1000Hz, 2000Hz & 4000Hz)
ICC	Intraclass Correlation
SPSS	Statistical Package for the Social Sciences
CAS1	Cognitive Anxiety Score at first interview
CAS2	Cognitive Anxiety Score at second interview
CAS3	Cognitive Anxiety Score at third interview

Units

dB	decibel
dBHL	Hearing Level in decibels
Hz	Hertz

1 Introduction

Hearing is important in many respects. Through hearing we interact with our environment, communicate with loved ones and orient ourselves. Therefore, a hearing impairment (HI) can influence an individual in several aspects. Untreated HI has been associated with depression symptoms, anxiety, increased social isolation and a general decrease in physical and psychosocial well-being (Dillon, 2012). Subsequently, by leaving HI untreated, a physical condition may also become a psychological one. In addition, previous studies indicate that significant others (SOs) experience as much frustration and anxiety symptoms as the person with the HI (Scarinci, Worrall, & Hickson, 2008; Stark & Hickson, 2004).

Over the years many studies have attempted to uncover the relationship between anxiety and adjustment to HI. However, past research has been limited in the sense that many of these studies have implied the construct of anxiety as a personality '*trait*' rather than a '*state*'. The Cognitive Anxiety Scale (CAS), which was used to measure cognitive anxiety (CA) in this study, differs from general anxiety as this scale measures state anxiety rather than trait anxiety. The aim of this study was to examine CA levels of first-time hearing aid users and their SOs before, during and after hearing aid fitting.

This chapter provides the context to this study by firstly explaining HI - its assessment and management - and then providing a review of the literature relating to CA and how it can be used in the assessment of hearing impaired adults (HIA) and their SOs. Based on this literature review, the rationale for the current study is presented at the end of this chapter. Before proceeding, it is important to clarify several terms used in this thesis. In the literature the terms 'deafness', 'hearing loss' and 'hearing impairment' have been used interchangeably, however, in this thesis the term HI is used. Similarly, the terms 'patient' and

‘client’ are used interchangeably in this thesis; while ‘patient’ implies sickness, it is commonly used at audiology clinics and in the literature. In addition, when relating to anxiety or depression, this relates to symptoms and not to the prevalence of clinical disorders such as anxiety disorders or clinical depression.

1.1 Hearing Impairment

1.1.1 Overview

In order to understand and discuss HI in adults one must begin with an understanding of how the human ear functions. There are three major structures of the ear: the outer ear, the middle ear and the inner ear. The outer ear includes the portion of the ear that can be seen on the outside, called the pinna, and the external auditory meatus, also called the ear canal. The pinna helps to funnel sound into the ear canal and assists with our ability to distinguish the direction of sound. The middle ear consists of the tympanic membrane, the ossicles, and the Eustachian tube. Sound travels from the outer ear through the ear canal, through the tympanic membrane and across the middle ear to the inner ear. The inner ear contains the organ of hearing ‘the cochlea’ which is a bony structure filled with fluid. The basilar membrane, which is located within the cochlea, is the base for the sensory cells of hearing, the hair cells. Each part of the basilar membrane (BM), together with the surrounding fluid, can be thought of as a ‘mass-spring’ system with different resonant properties; hence, processing of the higher frequencies occurs at the basal end of the BM where stiffness is highest and mass lowest. In contrast, lower frequencies are processed at the apex of the BM where stiffness is lowest and mass highest. In the cochlea the sound waves, transformed into mechanical energy by the middle ear, set the fluid of the cochlea and the BM into motion in a manner that is consistent with their intensity and frequency. Waves of fluid motion impinge on the

membranous labyrinth and set off a chain of events that results in neural impulses being generated at the VIIIth cranial nerve.

Hearing impairment as described by the World Health Organization (WHO) refers to both complete and partial loss of the ability to hear (World Health Organization, 2001) and can be divided into two distinct types plus a combination of these two types, conductive, sensorineural and a mixed, conductive-sensorineural HI. The type of HI depends on the cause. For example, a conductive HI (CHI) is caused by a problem in the outer ear or the middle ear. Most CHI can be improved or alleviated with medical or surgical treatment. A common example is chronic middle ear infection.

A sensorineural hearing impairment (SNHI), however, usually cannot be corrected by surgery or medicine and therefore is classified as a permanent HI. A SNHI occurs when there is damage to the inner ear (cochlea), or to the auditory nerve that runs from the inner ear to the brain. This is the most common type of permanent hearing impairment. There are several causes of SNHI, for example: noise-induced; ototoxicity; genetic or hereditary; presbycusis (Aging), head trauma; malformation of the inner ear.

The HI discussed in this thesis is a permanent HI rather than a temporary HI that may result, for example, from an ear infection. Those individuals who have a permanent HI and are experiencing difficulties as a result of their HI are typically offered hearing aids. Pure tone audiometry is used to identify the severity of the HI. This test assesses the lowest intensity a person can detect sound for each frequency, called the threshold, and is plotted on an audiogram (Harrell, 2002). The normal hearing threshold for each frequency for a person is said to be 0 decibel (dB) hearing level (HL). Thresholds between -10 and 20 dBHL are said to be within normal limits and seen as normal hearing. The severity of the HI is typically classified as mild, moderate, moderately-severe, severe or profound. For the clinics involved in this study, the classification system was as follows: mild = 21 – 40 dBHL; moderate = 41 –

55 dBHL; moderately-severe = 56 – 70 dBHL; severe = 71 – 90 dBHL; profound > 91 dBHL. The degree of impairment can differ across the frequencies and is often referred to as the configuration of the HI. For example, if the loss is greater at the high frequencies than at the low frequencies the loss would be titled a sloping loss. In contrast, in a rising loss, the loss is greater at the low frequencies than at the high frequencies. Given these different configurations, an objective measure is often used to describe the overall level of HI, called the pure tone average (PTA). This is the average of the individual's thresholds across three or four frequencies on an audiogram (500, 1000 and 2000 Hz or 500, 1000, 2000 and 4000 Hz).

1.1.2 Prevalence

HI is one of the most common chronic health conditions in the world, affecting all age groups, ethnicities and genders (Ask, Krog & Tambs, 2010). Overall, the prevalence among adults in western countries is estimated to be around 16-17% (Ask et al., 2010). With an ageing global population, the number of people with HI is rising and increasing with age (Agrawal, Platz, & Niparko, 2008). Prevalence of HI amongst adults aged 20-69 years in Australia has been estimated to be 16.6%, 16.1% in the United Kingdom and 16% in the United States of America (USA) (World Health Organization, 2005). However, estimates using a subjective measurement such as a self-report may find that underestimation of HI can occur.

No prevalence studies using objective measures of HI have been undertaken in New Zealand to this date. However, the first New Zealand population survey of individuals with HI was carried out in 1991 (Greville, 2005). This self-report survey estimated the prevalence in New Zealand to be around 10.3% (Greville, 2005). In addition, Greville (2005) reports that men are much more likely to suffer from HI than are women. This difference was also found in other developed countries and appears to be attributed to noise-induced HI.

1.1.3 Impact of Hearing Impairment

HI can be a disabling condition. Research has shown that even a mild HI can impair verbal language processing and thereby limit meaningful communication and social connectivity (Olusanya, Ruben, & Parving, 2006). In return, such communication difficulties can have a negative affect on work productivity, health related quality of life, cognitive and emotional status (Dillon, 2012; Olusanya et al., 2006). Untreated HI has been associated with depression, increased social isolation, decreased self-sufficiency, decreased cognitive function (even after allowing for age) and a general decrease in physical and psychosocial well-being (Dillon, 2012).

Psychological adaptation to HI varies widely across older individuals (Tambs, 2004). The majority of cross-sectional and prospective studies report elevated rates of psychological distress such as anxiety and depression in adults with age-related HI, with some showing a clear linear relationship between severity of HI and psychological distress (Tambs, 2004). Although it is common for an older adult to experience anxiety or depression symptoms in the context of medical conditions, several factors distinguish distress following HI (Zarit & Zarit, 2007). First, older adults with compromised hearing are often concerned that missing portions of conversations, problems with communication, and decreased interaction with family and friends will cause them to appear ‘stupid’ or ‘crazy’ (Dalton et al., 2003). The focus of this anxiety is often more relevant to negative evaluation by others than to the problems of HI per se (Jones, Victor, & Vetter, 1984), and can eventually lead to avoidance of social activities and decreased confidence in social situations (Heine & Browning, 2002). Surprisingly, Kramer et al. (2008) found lower self-efficacy and perceived social support among older adults with presbycusis than those with acute conditions such as cancer, osteoarthritis, rheumatoid arthritis, diabetes mellitus, and several other chronic diseases.

The International Classification of Functioning, Disability and Health (ICF) is a classification system developed by the WHO, which provides a framework, as well as standardised language, for describing health conditions and their impact (World Health Organization, 2001). It is important to note that in the ICF framework individuals are not the units of classification; that is, the ICF does not classify individuals, but describes the situation of each individual within an array of health or health related domains. Furthermore, the description is always made within the context of environmental and personal factors (World Health Organization, 2001). For example, the WHO (2001) refers to a hearing disability as the impact of a HI on a person's everyday life, including social, emotional and occupational considerations. Therefore, the 'disability' is due not only to the individual, referred to as personal factors, but also the society within which the individual exists, referred to as environmental factors.

Figure 2 illustrates the relationship between various components of the ICF. The ICF consist of two parts, which contain two separate components (World Health Organization, 2001).

Part 1: Functioning & Disability

1. Body Functions & Structures
2. Activities & Participation

Part 2: Contextual Factors

1. Environmental Factors
2. Personal Factors

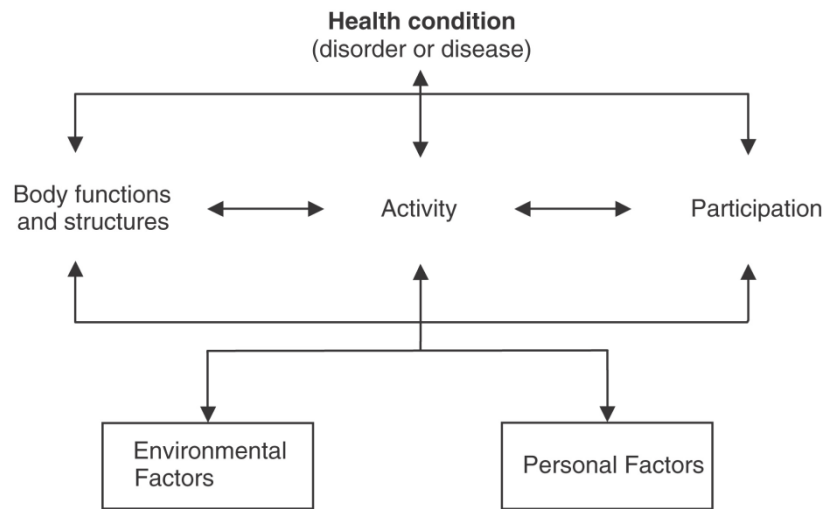


Figure 1. Model showing the interactions between components of the ICF (World Health Organization, 2001).

The ICF defines ‘Body Structures’ as the anatomical parts of the body such as organs, limbs and their components, and ‘Body Functions’ as the physiological functions of the body systems, including psychological functions. ‘Activity’ is defined as the execution of a task or action by an individual, while ‘Participation’ is defined as involvement in a life situation. ‘Environmental Factors’ constitute the physical, social and attitudinal environment in which the person lives and goes about their life (World Health Organization, 2001). ‘Personal Factors’ are internal factors which affect an individual’s functioning but are not part of a health condition, for example, gender, ethnicity, age, lifestyle, fitness, habits, upbringing, social background, coping styles and education (World Health Organization, 2001).

Each of the components can be seen in both positive and negative terms. For example, with respect to ‘Activities and Participation’ the terms ‘activity limitations’ and ‘participation restrictions’ may be used to characterise a health condition which is hindering an individual’s involvement in his or her environment. An ‘activity limitation’ can occur when an individual has difficulty executing an activity, and a ‘participation restriction’ occurs when the individual has problems being involved in certain life situations (World Health Organization, 2001). Activity limitations and participation restrictions have both been negatively correlated

with wellbeing scores (Helvik, Jacobsen, & Hallberg, 2006a; Hickson et al., 2008) and quality of life (QoL; Hickson et al., 2008). For example, activity limitations caused by a HI can include the following (Laplante-Lévesque, Hickson & Worrall, 2010):

- Speech perception, especially in situations with noise such as understanding speech in a noisy restaurant
- Understanding speech on television or radio
- Localization of sound sources such as footsteps and cars
- Detection of environmental signals such as ringing telephones, doorbells and alarms

Some examples of participation restrictions caused by HI include (Laplante-Lévesque et al., 2010):

- Withdrawal from previous involvement in community life
- Avoidance of interpersonal interactions

As seen in Figure 2, a person with a HI (health condition) may experience difficulty understanding speech in a noisy environment (activity limitation) and thus as a consequence chooses not to go to restaurants anymore (participation restriction).

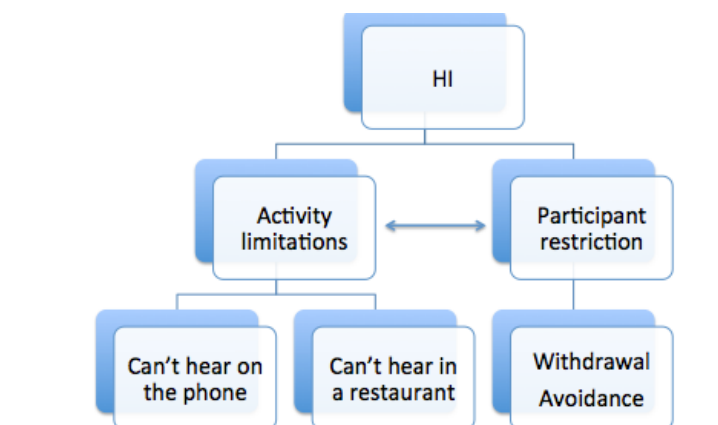


Figure 2. Interaction between activity limitation and participant restriction.

Furthermore, the SO of this individual with HI may not have any impairment or activity limitation, yet may experience the same or even a different participant restriction as a hearing impaired adult. For example, the SO of an individual with HI cannot have a conversation with his partner when out in a restaurant due to his HI, and therefore is avoiding and withdraws from such social occasions. However, as discussed earlier, consequences of HI extend beyond the activity limitations and participation restrictions described above.

Bilateral age-related HI has been associated with poor health related QoL in both physical and mental domains (Chia et al., 2007). Therefore, the impact of HI on an individual can vary depending on a range of factors and cannot be reliably predicted from the audiogram alone (Wiley, Cruickshanks, Nondahl, & Tweed, 2000). For example, Demorest, Wark, and Erdman (2011) stated that while the difficulties experienced by an individual are related to audiometric results, the audiogram itself cannot predict the extent of the communication and adjustment difficulties experienced. Moreover, the variances in the difficulties experienced by HI individuals suggests that there are other variables affecting the way in which the HI is experienced, and thus subjective report of the individual's hearing problems is necessary to assess the need for rehabilitation (Demorest et al., 2011).

In recent years, speech pathologists and audiologists have demonstrated an increased awareness and understanding of the value of the ICF in describing the impact of communication and related disorders on their clients. Previous research reflects the increased application of the ICF to speech pathology and audiology clinical practice and research (Ma, Worrall, & Threats, 2007; Worrall, Ma, & Threats, 2008). These publications and others have outlined the use of the ICF to classify the communication and swallowing difficulties experienced by people with aphasia (Simmons-Mackie & Kagan, 2007), dementia (Byrne & Orange, 2005; Hopper, 2007) and HI (Hickson & Scarinci, 2007). The following section

outlines the literature on the impact of HI on the SO and is followed by the application of the ICF to significant others of hearing impaired individuals (Third-party disability).

1.1.3.1 Impact of Hearing Impairment on the Significant Other

HI is one of the most common chronic health conditions in the world and with an ageing global population, the number of people with HI is rising and increasing with age (Ask et al., 2010). It is now widely recognized that HI can have negative implications for individuals experiencing it, including depression symptoms, life dissatisfaction and reduced QoL (Tambs, 2004; Hickson et al., 2008). Previous research in this area has highlighted a range of activity limitations and participation restrictions that occur as a result of HI (Laplante-Lévesque et al, 2010). However, somewhat less well documented is the impact of HI on the SO. People with HI do not live in isolation. Thus, both the person with HI and their SOs will experience effects of a result of the HI. This is especially the case when the SO is the most frequent communication partner of the hearing impaired individual. As mentioned before, while the HI individual directly experiences the impact of HI, the SO may experience participation restriction and activity limitations as they interact and communicate with their partner.

Previous studies indicate that SOs experience as much frustration and anxiety as the person with the HI (Scarinci, Worrall, & Hickson, 2008; Stark & Hickson, 2004). A study by Stephens et al. (1995) found that SOs report more problems with psychosocial issues and spoken communication when compared to their hearing impaired partners. Gerontology research by Wallhagen, Strawbridge, Shema, and Kaplan (2004) indicated that level of hearing loss in 418 older married couples was associated with SOs lower mental, physical, and social well-being.

HI might be difficult to deal with for the because it reduces the quality and the quantity of couple communication. Past research has shown that SOs can experience numerous effects resulting from their partners HI (Scarinci, Worrall & Hickson, 2009). Such effects include, difficulties communicating with their partners in background noise, difficulty coping with the raised television and radio levels, always having to answer the phone and having to act as an interpreter when with the other person (Scarinci et al., 2009).

Considering the importance of communication between partners, a person's HI may negatively affect the relationship, even when the impairment is classified as only a 'mild hearing impairment' (Brooks, Hallam & Mellor, 2001). Communication problems manifest themselves through constant repetitions and misunderstandings and a decrease in intimate talk and joking (Piercy & Piercy, 2002). Because of such communication problems, the SO becomes an important communication aid and respectively a possible caregiver to the hearing impaired person (Ask et al., 2009). Therefore, communication difficulties and possible care giving for the HI might represent a stressor for the SO and can affect mental health and subjective well-being (Ask et al., 2009). Furthermore, numerous negative effects on the marital relationship have also been reported (Hétu et al., 1993; Scarinci, Worrall, & Hickson, 2008). For example, a study by Jones et al. (1987) discovered that the majority of participants reported changes in interpersonal relations within the family as a result of HI and the relationship was 'less personal' in 40% of participants.

Hétu et al. (1988) interviewed wives of men with HI and described a wide variety of problems. For example, the wives needed to use more effort in order to communicate with their hearing impaired husbands; they frequently had to repeat themselves; they had to speak slower and louder and they often had to move closer to their husbands in order to be heard. In addition, the wives described anxiety and stress as a result of their husband's HI especially when they had to serve as the "ears" for their partner (e.g., taking their husband's phone

calls). Wives also reported changes in social activities because their husbands would avoid restaurants, parties, and social gatherings.

Subsequent research conducted by Brooks, Hallam, and Mellor (2001) reported that: (1) spouses feel burdened when they have to act as an interpreter in group situations or in delicate situations (e.g., at a doctor visit), (2) spouses are frequently irritated when the television or radio is too loud or when they frequently have to repeat something that is missed on the television, and (3) spouses tend to reduce what they communicate to their partners with hearing loss and limit their conversation to the ‘essentials.’

More recent research conducted by Scarinci et al. (2008) investigated the effect of HI on SOs living with HI individuals. In-depth interviews were conducted with five female and five male spouses of older people with HI. Overall, participants reported a wide range of effects on their everyday lives ranging from communication difficulties to emotional consequences as well as effects on their relationship, social life and routine everyday activities. Furthermore, participants reported difficulties relating to everyday activities such as television viewing and telephone usage. This is consistent with previous research conducted by Morgan-Jones (2001) which reported increased responsibilities of SOs around telephone usage and specifically the need to act as a ‘secretary’ for their hearing impaired partners.’

1.1.3.1.1 Third Party Disability and Two-Sided Analysis

The effect of HI on SOs living with HIA is increasingly being acknowledged as a significant consequence of HI in the older population. In the ICF manual, the WHO has labeled this phenomenon as ‘third-party disability’ (World Health Organization, 2001). A third party disability is defined as the disability and functioning of family members due to the health condition of their SO and was identified as a direction of future development by the WHO (2001). As discussed earlier, research has identified the usefulness of applying the ICF

to clients with communication and swallowing disorders (Simmons-Mackie & Kagan, 2007; Byrne & Orange, 2005; Hopper, 2007; Hickson & Scarinci, 2007), however, there has been a lack of research of the ICF to the client's family and SO. The CAS used in this study is a direct measure of the impact a HI has on the SO. That is, although the SOs do not have the health condition of HI, they may experience impairments, activity limitations and participation restrictions as a result of the health condition of their hearing impaired partners.

Stephens and Héту (1991) proposed an extension of the original WHO definition of handicap to include a reference to the handicap experienced by SOs. This also included making a distinction between 'primary' (initial experiences of the individual's hearing impairment on everyday life situations) and 'secondary handicaps' (the negative consequences of the individual's attempts to reduce their handicap, e.g., fatigue, anxiety) to incorporate the role of SOs. 'Secondary handicaps' are particular relevant to the study of third-party hearing disability because of the number of adaptations SOs have to make as a result their partner's hearing disability.

To visualise the possible effects of third-party disability and the interaction of various components, a modified model of the ICF is shown in Figure 3 (Scarinci et al., 2009b). The functioning and disability of the person with HI is illustrated on the left-hand side of the figure as a separate ICF framework. It shows that third party-disability stems from the partner's HI. The partner's HI can be viewed as an environmental factor that produces the SOs third-party hearing disability. However, the SOs functioning and third-party disability may also be influenced by personal factors (e.g., gender, coping strategies, perception of their partner's hearing disability) and environmental factors (e.g., the hearing impaired partner's self-reported hearing disability, the presence of hearing aids) (Scarinci et al., 2009b).

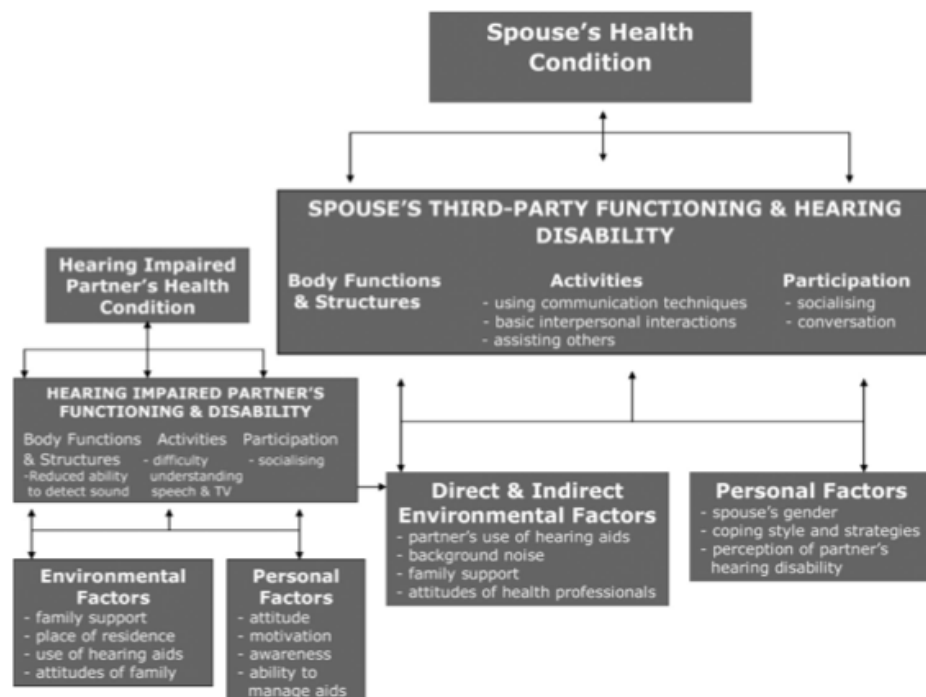


Figure 3. Application of the ICF to third-party hearing disability in significant others (spouses) of older adults with hearing impairment (Scarinci et al., 2009b)

Despite this introduction to the potential application of the ICF to SOs, only a few publications since have used the ICF terminology and specifically the concept of third-party disability to describe the stresses faced by SOs of those individuals with communication disorders (Byrne et al., 2007; Scarinci et al., 2009b).

As discussed above there are differences in how HI effects HIA and their SOs. Due to this difference past research has identified two different approaches, one-sided analysis and two-sided analysis. Héту et al. (1993) presented an overview of the literature and data collected by the authors on the question of how hearing difficulties are experienced within the context of close relationships and how a different methodology could capture such a difference in clinical practice. Figure 4 below illustrates an information transmission line where the HIA is asked to act as a messenger towards their SO.



Figure 4. Information transmission line where the hearing impaired adult is asked to act as a messenger towards their significant other

This figure illustrates nicely how the information can get lost if the HIA is acting as the messenger between the audiologist and the SO. Héту et al. (1993) proposed that it is likely that such a transmission line has a low degree of effectiveness because the transmitter:

- (a) has received this information while emotionally reacting to its significance in his/her life
- (b) is generally reluctant to talk about hearing difficulties
- (c) is inevitably inclined to accompany the information by request to his/her partner for more understanding and
- (d) may not be specifically skilled in transmitting information in general

They concluded that information needs of the SO can only be poorly answered with such an information transmission line. For most people, intimate relationships are very vulnerable to the effects of HI. Accordingly, the difficulties experienced are fundamental in the coping process. This is generally taken into account in audiological rehabilitation but in the context of a one-sided perspective (Héту et al., 1993). That is, the SO is seen only as a provider of support and understanding to the hearing impaired partner. This view tends to deny the legitimate needs and perspective of the intimate partner regarding the hearing problems (Héту et al., 1993). Hence, the partner is invited to act as an auxiliary to the audiologist's attempts to reduce the hearing difficulties. Restricting the focus of the

intervention on the needs of the impaired person can only devalue the experience of handicaps by the SO (Hétu et al., 1993). For the latter, it may result in inducing or reinforcing guilt from the negative feelings generated by the HI. This, in turn, is not helpful in reducing tensions and frictions within the relationship. Hétu et al. (1993) concluded that the needs of both partners should be taken into account in this process. They proposed a two-sided perspective on intimate relationships using three dimensions of audiological intervention, namely information, support and the opportunity for negotiation.

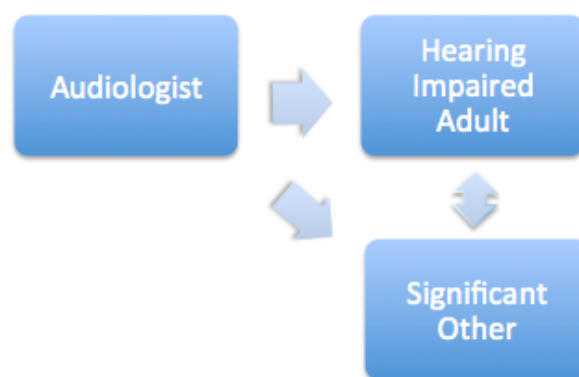


Figure 5. An example of a two-sided analysis

Figure 5 illustrates a two-sided analysis that includes the SO in the rehabilitation process. Such an analysis can convey information effectively and should be done with both partners being present, and with appropriate communication skills on the part of the clinician. Therefore, a two sided approach is recommended in order capture the effect of HI on both individuals, hearing impaired and their normal hearing SOs.

Recognition and resolution of difficulties within the communication environment of HIA may help both parties (HIA and SO) to proceed successfully into a hearing rehabilitation program (Armero, 2001). Past research conducted by Erber (1993) suggests that family relationships have the capacity to enhance or detract from the hearing impaired person's

potential for rehabilitation. This is also supported by Miller (1983) who indicated that the probability for successful rehabilitation is greatly enhanced if there is complete support from SOs. Information about the effects of HI, such as CAS scores, on the SO may therefore help in the identification and reduction of the negative effects of HI on the family. Hoover-Steinwart, English, and Hanley (2001) found that inclusion of SOs in discussions pre-hearing aid fitting resulted in improved hearing aid benefit for the person with HI. Furthermore, Stephens (1996) also discussed the importance of acknowledging SOs in his psychosocial approach to hearing rehabilitation, proposing that clinicians should assess the attitude and functioning of the SO through the use of questionnaires, discussion about the couple's problems, and observing the couple's interaction. He further recommends direct involvement of SOs in decision making and goal setting, both in joint sessions and separately (Stephens, 1996). Moreover, Gagné (1998) further emphasised the important role that SOs play in audiological rehabilitation, noting that solutions to hearing difficulties encompass not only the person with the HI, but also his or her SOs, and thus SOs are also candidates for rehabilitation services (Gagné et al., 1995).

1.1.3.2 Effect of Individual Factors on the Impact of Hearing Impairment

As previously discussed, the impact of HI can be affected by individual factors. Some studies have demonstrated that individual factors, such as smoking, elevated blood pressure and cholesterol levels, may influence the degree of age related hearing impairment (ARHI) (Cruickshanks, Klein, Klein, Wiley, Nondahl & Tweed, 1998), while research conducted by Tambs (2004) revealed that HI has more of an impact among young (20-44 years) and middle-aged (45-64 years) individuals than among older (65+ years) individuals. This is an interesting finding considering self-esteem and age. The effects on self-esteem have shown to disappear almost completely with old age, when impaired hearing is seen as a normal rather than an unusual disability (Tambs, 2004). Similar but less strong trends apply for anxiety,

depression, and well-being. Therefore, HI can have more of an impact on younger adults rather than older individuals. The decreasing effect with age may suggest that the functional loss per se is not the most important cause of impaired mental health and well-being. Older individuals appear to be more accepting of their HI because it is normal to them whereas younger individuals who have a less severe HI may suffer from being different in terms of not being able to function as expected for people at their age (Tambs, 2004).

Furthermore, the strongest effects of HI were found to be for depression and self-esteem amongst younger men (Tambs, 2004). This gender difference could be due to career expectations for men. For example, due to the HI, men could experience stronger feelings of being disabled at work, and maybe even the thought of not being able to provide for his family the same way he has done in the past, could produce lower self esteem and more depression symptoms overall. However, in contrast, other studies have found that women place a greater importance on social communication than men and in turn maybe more affected by HI (Erdman & Demorest, 1998).

Helvik, Jacobsen, & Hallberg, (2006b) and de Graaf & Bijl (2002) showed that personality also affects the impact of HI. In a sample of adults with HI, sense of humour was positively associated with psychological well-being (Helvik et al., 2006b), while lower levels of self esteem and a lack of acceptance of the HI were associated with higher levels of mental distress (de Graaf & Bijl, 2002). Furthermore, the ability to communicate may also affect the impact of a HI on an individual. For example, de Graaf & Bijl (2002) found that individuals who were less competent at speech-reading had higher levels of mental distress.

1.1.3.3 Effect of Environmental Factors on the Impact of Hearing Impairment

Environmental factors, as classified in the ICF, make up the physical, social and attitudinal environment in which people live and conduct their lives (World Health Organization, 2001). These factors are external to individuals and can have a positive or

negative influence on the individual's performance as a member of society, on the individual's capacity to execute actions or tasks, or on the individual's body function or structure. There is a general consensus that ARHI is the result of various types of physiological degeneration plus the accumulated effects of environmental factors, medical disorders and their treatment, as well as individual differences in susceptibility genes (Liu & Yan, 2007).

In addition, the impact of an individual's HI may also be affected by environmental factors such as individuals' support network and occupation, which can influence, for example, the level of demand placed on the individual to communicate, and the quality of communicative exchanges. Knutson and Lansing (1990) found that poorer communication with family and friends was associated with feelings of loneliness and isolation.

Noise is the most studied and best-documented environmental factor causing HI. Ultimately, after a lifetime of noise exposure, it is difficult to distinguish between noise induced HI (NIHI) and ARHI, audiometrically as well as anatomically (Liu & Yan, 2007). Furthermore, environmental factors, such as ototoxic substances, drugs or even diet, can influence each individual's susceptibility to ARHI (Houston et al., 1999; Aran, Hiel & Hayashida, 1992; Boettcher, Gratton, Bancroft & Spongr, 1992). Aminoglycoside antibiotics have been shown to damage hair cells in the same pattern as noise, causing a non-reversible HI predominantly affecting the higher frequencies. In addition, aminoglycosides seem to enhance the ototoxic effect of noise and vice versa (Aran et al., 1992).

The impact of HI may also be affected by the manner in which the impairment occurred and how well the individual coped with the situation. A gradual HI has been associated with greater levels of depression and anxiety symptoms than when the HI occurred suddenly (de Graaf & Bijl, 2002). In addition, there seems to be a greater effect on one's mental health when the hearing threshold deteriorates from a normal to a mild HI compared

to when it declines from mild to profound (Tambs, 2004). One possible explanation for this could be that with a mild HI there is the risk that the hearing could deteriorate further in the future, whereas with a profound HI, the impact of further deterioration would be less extensive and therefore the individual would have less anxiety about it.

1.1.4 Rehabilitation Interventions for Hearing Impaired Individuals

There are several rehabilitation interventions for adults with HI such as hearing aids, hearing assistive technology and communication programs.

1.1.4.1 Hearing aids

There are a number of hearing aid (HA) manufacturers with each producing HAs of varying style, size, price and signal processing features (Laplane-Lévesque et al., 2010). A HA is adjusted to each individual's HI allowing amplification of sounds to a level that the wearer can perceive. All HAs have the same basic components, which include the following, as seen in Figure 6 (Dillon, 2012):

- A microphone, which transforms the acoustic signal into an electric signal
- An amplifier, which increases the level of the signal based on the user's HL and preference
- A receiver, which transforms the electric signal back into an acoustic signal and delivers the sound into the person's ear
- A battery to power the system

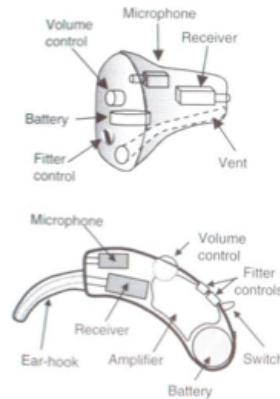


Figure 6. Components of an In-The-Ear hearing aid (ITE) & Behind-The-Ear hearing aid (BTE; Dillon, 2012).

Overall, hearing aids have been found to be useful in the rehabilitation process of hearing impaired individuals. A review by a task force of the American Academy of Audiology concluded that hearing aids improve adults' health-related quality of life (HRQoL) by reducing psychological, social, and emotional effects of SNHI (Chisolm et al., 2007).

1.1.4.2 Hearing Assistive Technology

Hearing assistive technology systems (HATS) are devices that can help an individual to function better in everyday communication situations. HATS can be used with or without hearing aids to make hearing overall easier. Hearing aids used in conjunction with HATS produce better listening and better communication. Such systems can be used in the following contexts (Laplane-Lévesque et al., 2010):

- One-on-one or group conversations
- Telephone communication
- Reception of TV, radio and sound systems
- Reception of public address systems

Some examples of HATS are (Dillon, 2012):

- Frequency Modulation (FM) Systems – FM systems are widely used in educational settings for children with HI but can also be beneficial for adults in structured settings such as meetings.
- Induction Loop Systems – can be used in public areas such as theatres, churches etc.
- Infrared-Systems - which can be used watching television or listening to the radio

The importance of hearing assistive technologies in the management of adults with HI was acknowledged in an evidence-based clinical practice guideline developed by the American Academy of Audiology (Chisolm et al., 2007). Furthermore, numerous investigations have demonstrated that FM systems can improve the speech perception ability of individuals with SNHI in noisy listening environments (Lewis, Valente, Horn, & Crandell, 2005; Dillon, 2012). Specifically, past investigations have demonstrated that FM technology can improve the signal-to-noise ratio (SNR) for listeners with HI by as much as 20 dB over unaided listening (Fabry, 1994; Pittman, Lewis, Hoover, & Stelmachowicz, 1999; Crandell & Smaldino, 2001) and 12 to 18 dB over hearing aid alone listening conditions (Lewis, Crandell, Valente, & Horn, 2004).

1.1.4.3 Communication Programs

Communication programs focus on adults with HI in order to improve speech perception and/or communication management (Gagné & Jennings, 2008). Speech perception training encompasses auditory training, speech-reading training and auditory-visual training, while communication management refers to programs that target communication strategies, conversational fluency, assertiveness, stress management, and personal adjustment (Laplan-

Lévesque et al., 2010). Some communication programs are designed for people with hearing aids, whereas others target individuals who do not wear hearing aids.

Hawkins (2005) used an evidence-based practice approach to review the effectiveness of counselling based adult group aural rehabilitation (AR) programs. He looked for studies in which adults with HI participated in a group class that included communication strategies, personal adjustment counselling, information about hearing and hearing devices, and/or group counselling. Hawkins (2005) concluded that there were potential short-term benefits from adult AR groups. These benefits included reduced hearing handicap, improved self-perceived QoL, and improved use of communication strategies.

Sweetow and Palmer (2005) conducted a systematic evidence based review of the auditory training (AT) literature and produced evidence supporting the efficiency of such programs. Furthermore, some studies further supported the finding that speech recognition skills, particularly in noise, can be improved by synthetic or combined training.

1.1.5 Assessment of Hearing Impairment

Activity limitations and participant restrictions are typically assessed through self-assessment tools. There are many instruments that can be used to identify the functional impact of HI. Some questionnaires assessing HI used in clinical settings include (Dillon, 2012):

- HHS - The Hearing Handicap Scale (20 items) / High, Fairbanks, & Glorig (1964)
- APHAB – Abbreviated Profile of Hearing Aid Benefit (24 items) / Cox & Alexander (1995)
- HHIA – Hearing Handicap Inventory for Adults (25 items) / Newman, Weinstein, Jacobson & Hug (1990)

- HHIE - Hearing Handicap Inventory for the Elderly (25 items) / Ventry & Weinstein (1982)
- HHIE-S - Hearing Handicap Inventory for the Elderly Screening test (10 items) / Ventry & Weinstein (1983)
- CPHI - Communication Profile for the Hearing Impaired (4 subscales) / Demorest & Erdman (1987)

Self-report questionnaires are extremely useful and have been much used in recent years. In general, self-assessment tools are inexpensive and easy to administer. They can be applied to a wide range of purposes and used with a wide range of populations (Dillon, 2001). In addition, self-assessment tools tend to be non-threatening and non-invasive. However, limitations exist due to the fact that each questionnaire relies on the participant's self-awareness. Therefore, questionnaires are only able to offer limited information. In order to truly assess the needs of individuals with HI and their SO both self-report questionnaires and interview data are needed.

There are two questionnaire that have been developed to measure how much impact HI has on SOs. Scarinci et al. (2009) developed the Significant Other Scale for Hearing Disability (SOS-HEAR). This scale was established as a means of identifying SOs of older individuals with HI in need of intervention. The scale consists of a number of different domains of third-party disability and functioning, including communication changes, communicative burden, relationship changes, going out and socializing, emotional reactions to adaptations, and concern for partner. However, the SOS-HEAR is the first of its kind and further research is needed to ensure its reliability and validity.

Recently Preminger & Meeks (2012) have developed a second questionnaire in order to measure third-party hearing loss related quality of life (HLRQoL) in spouses of people

with hearing loss, the Hearing Impaired Impact-Significant Other Profile (HII-SOP). This scale was developed to describe activity limitations and participation restrictions experienced by spouses as a result of living with HIA. The HII-SOP is a 20-item scale with three subscales which measure: (1) the emotions that arise when having a spouse with hearing loss as well as the impact of the hearing loss on the marital relationship, (2) the impact of the hearing loss on the social life of the spouse, and (3) the communication strategies used by the spouse. Results indicate that the scale and its subscales have adequate internal-consistency reliability. The HII-SOP scale was significantly correlated with measures expected to relate to the construct of third-party disability associated with hearing loss. Furthermore, results indicated that the HII-SOP scale has adequate test-retest reliability. Items for the SOS-HEAR were generated from results of a single qualitative study which used participants over the age of 60 (Scarinci et al., 2008), whereas the items for the HII-SOP were generated from the results of several published studies using reports of both younger and older adults (Preminger & Meeks, 2012).

1.1.6 Adjustment to Hearing Impairment

Adjustment to HI is a process wherein the individual makes cognitive as well as behavioural and attitudinal changes to minimize hearing-related problems through clinical training programmes and professional support (Erdman & Demorest, 1998). Clinical observations and studies have long confirmed that disability and handicap cannot be predicted from audiometric data alone (Erdman & Demorest, 1998; Gopinath et al., 2012). Furthermore, it has also been reported that the decision to seek audiological intervention is correlated more strongly with perceived disability and handicap than with the degree of HI per se (Gatehouse, 1994; Andersson & Green, 1995). However, individuals with HI continue to be managed primarily on the basis of their audiograms which contributes to our continued inability to predict which individuals are more likely to experience communication and

adjustment difficulties, who will benefit from amplification, or who needs additional rehabilitation services (Erdman & Demorest, 1998). A scientific basis for understanding the adjustment problems experienced in relation to HI and its resultant communication dysfunction has critical implications for (a) the development of effective rehabilitation strategies, (b) the implementation of effective intervention models, (c) the education of those entering the hearing health care profession, and, most importantly, and (d) the life quality of individuals who are hearing impaired (Erdman & Demorest, 1998).

Ultimately, successful treatment entails resolving the effects of communication dysfunction on the individual's psychosocial functioning and well-being. Hence, rehabilitation cannot focus solely on medical and technological approaches; it must also have behavioural and psychosocial components (Erdman & Demorest, 1998). Understanding auditory factors alone is insufficient; it is also necessary to understand the environmental, psychosocial, and behavioural variables associated with adjustment to HI.

Hallberg (1999) stated that coping plays a large role in the adaptation to HI. Overall, if positive or adaptive, coping strategies are able to reduce stress in communication situations, whereas maladaptive strategies may result in greater feelings of handicap (Hallberg, 1999). When adjusting to HI, both general coping styles, the personality of the individual as well as the psychosocial environment, are likely to be involved. Her study revealed two coping patterns: 1) to control the social scene, and 2) to avoid the social scene. The controlling strategies included management of the situation, informing others about their HI, and generally taking responsibility to ensure they hear what is said. Avoiding strategies on the other hand, included avoidance of difficult listening situations, isolation from other people, and minimizing the disability which we will see later on can produce anxiety. Gomez and Madey (2001) revealed that the use of both adaptive and maladaptive strategies was more likely if the HI individual perceived that a particular strategy was useful, regardless of

whether it aided communication. Thus, while maladaptive strategies may not enhance communication, HI individuals may see them as a way to help them cope with their impairment.

1.1.6.1 Hearing Aid Adoption

Results of a recent study reported that only one in four adults in the USA with HI actually own hearing aids (Kochkin, 2012). These outcomes are similar to results published more than 20 years earlier (Gates, Cooper, Kannel, & Miller, 1990). Older individuals with HI are more likely to wear hearing instruments when compared to their younger counterparts (Kochkin, 2005). In the Kochkin (2005) survey, less than 10% of adults aged 35–64 years with HI reported owning hearing aids. In contrast, 24.4% of adults aged 65–74 years and 29.7% of adults aged 75–84 years reported owning hearing instruments. Davis, Smith, Ferguson, Stephens, and Gianopoulos (2007) stated that individuals who are referred for audiological assessment often report that they have had a HI for at least 10 years. Overall, studies have shown that an individual with HI takes on average seven years to seek services while non-adopters have known about their HI for approximately twelve years (Kochkin, 2009). Kochkin (2007) believes there are four events which must occur in order for individuals to seek a help for their HI: 1) recognition of the HI, 2) recognition that the HI causes them difficulties, 3) belief that the solution (for example, hearing aids) will decrease the difficulties experienced, and 4) recognition that individuals may have many factors hindering their progress towards a solution. He believes that once individuals have accepted they have an impairment, and realise that assistance is required, they can then focus on the rehabilitation itself, allowing them to participate in social situations and enhancing communication exchanges.

1.1.6.2 Factors influencing Hearing Aid Adoption & Help-Seeking

Effective rehabilitation of sensory deficits significantly affects QoL and even mortality rates (Appollonio, Carabellese, Frattola, & Trabucchi, 1996; Bridges & Bentler, 1998; Crandell, 1998). An accumulating body of evidence shows that elderly HIA who use amplification live happier, longer, and healthier than those who do not (Cox, Alexander & Gray, 2005). As mentioned earlier, despite the known benefits of amplification, only a small fraction of HIA actually use hearing aids (Kochkin, 2001).

Research conducted by Swan and Gatehouse (1990) suggests that for many people, it is not the degree of hearing impairment per se that prompts help-seeking or hearing aid uptake. The study investigated individuals referred to an audiology clinic (consulters) with hearing-impaired individuals in the population who have never sought advice (non-consulters). The aim of the study was to identify factors which lead some individuals with hearing problems to seek help while others with similar impairments do not seek advice. Results revealed that consulters appear to have more disability than non-consulters. In addition, consulters rate themselves more handicapped than non-consulters. They concluded that such factors are the main reasons which influence self-referral.

Several studies have identified a relationship between self-perceived hearing handicap and hearing aid uptake (Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001; Humes, Wilson, & Humes, 2003). A review of studies reveals several consistent themes, summarized below (Fino, Bess, Lichtenstein, & Logan, 1992; Swan & Gatehouse, 1990; van den Brink, Wit, Kempen, & van Heuvelen, 1996):

- Individuals with greater audiometric threshold impairment are more likely to seek amplification.

- Among individuals with the same impairments, those with greater self-reported disablement, resulting from the impairment are more likely to seek amplification.
- Individuals who do not seek amplification despite diagnosed impairment often display a constellation of attitudes that mitigate against seeking hearing aids. For example, they tend to believe that hearing aids are too costly, too conspicuous, and/or not very helpful.

Robertson, Kelly-Campbell, & Wark (2012) compared clinical charts for three groups of adults who consulted for services: (a) those who purchased hearing aids and continued wearing them for at least 1 year, (b) those who purchased hearing aids but rejected them, and (c) those who did not follow the recommendation to purchase hearing aids. Results revealed that the three groups were not significantly different in terms of degree of HI or ability to understand speech in quiet settings. However, they were significantly different in terms of their ability to understand speech in noise, which can be seen as an activity limitation. This is also supported by Helvik, Wennberg, Jacobsen, & Hallberg (2006) who reported that greater activity limitation and participation restriction decreased the likelihood in which an individual would reject a hearing aid.

Research over the years has also suggested other factors implicated in hearing aid adoption which include the following:

- measureable hearing impairment (Fisher, Cruickshanks, Wiley, Klein, Klein, & Tweed, 2011; Gopinath et al., 2011)
- bilateral hearing impairment (Kochkin, 2007)
- greater difficulty in one-to-one conversations and group situations (Hogan et al., 2001)
- decreased ability to understand speech-in-noise (Robertson et al., 2012)

- greater awareness of a hearing impairment (Gopinath et al., 2011; Kochkin, 2007; Palmer, Solodar, Hurley, Byrne, & Williams, 2009)
- increased activity limitation and participation restrictions (Helvik et al., 2006)
- less social support (Cox et al., 2005)

Research by Garstecki and Erler (1998) revealed that non-adopters were more likely to express concern about costs. This is also supported by Kochkin (2007). In his survey 76% of the respondents mentioned financial constraints as a barrier to hearing aid adoption. Forty-nine percent of those respondents indicated that unaffordability was the definite reason for not getting hearing aids and more than half (52%) indicated high maintenance cost as a reason for non-adoption. Additionally, cost was reported as a barrier to adopting hearing aids in the USA population (where there is no government subsidy). In addition, Laplante-Lévesque et al. (2010) also cited government subsidy as a factor for non-adoption in their study.

Further research has suggested that individuals may believe their HI does not yet warrant a hearing aid (Gopinath et al., 2011; Kochkin, 2007; Öberg, Lunner, & Andersson, 2007), that hearing aids are too expensive (Fischer et al., 2011; Gopinath et al., 2011; Kochkin, 2007) and are inconvenient (Fischer et al., 2011). They may report hearing negative experiences reported by others (Gopinath et al., 2011; Fischer et al., 2011), or have negative beliefs regarding aspects of the hearing aids themselves (Kochkin, 2007), a lack of knowledge regarding where to get help for their HI (Kochkin, 2007), or are discouraged by the stigma associated with hearing aid use (Kochkin, 2007). Furthermore, as discussed earlier, Helvik et al. (2008) found that individuals who choose to not adopt hearing aids are more likely to use maladaptive behaviours. Recall that increased use of maladaptive

behaviours is related to reduced QoL (Hallberg et al., 2008; Helvik, Wennberg, Jacobsen, & Hallberg, 2008).

Cienkowski & Pimentel (2001) conducted a survey of normal hearing college students, older HIA who had adopted hearing aids and older HIA who had not adopted hearing aids. Results revealed that over half (52%) of the college students would be concerned to be seen wearing a hearing aid, while more than one third would feel embarrassment. The non-adopters were also more likely to associate hearing aids with aging, perhaps one reason as to why they had not yet adopted hearing aids (Cienkowski & Pimentel, 2001). Interestingly, the college students and the older HIA who had no experience using hearing aids believed that hearing aids are easy to adjust and beneficial.

Research conducted by Espmark and Scherman (2003) suggests that HIA will not adopt hearing aids until their HI is experienced as a lack of contact with life. Open-ended interviews were conducted with each person and overall ten categories emerged: 'Conversation takes away or maintains identity', 'It's other people's fault that I can't hear', 'Other people make you realize you can't hear', 'Society makes you think you shouldn't mind about your hearing loss', 'It's natural to hear badly when you are old', 'You should hear well all your life', 'You want to keep a feeling of continuity in your daily life in spite of your hearing loss', 'You don't need to hear everything', 'You want to hear so you feel that you're alive', and 'You want to hear so you understand and keep yourself informed'. All these categories deal with identity or existence and form the basis for how the HI is experienced and managed. The HIA protected their identity in various ways, but above all by blaming their poor hearing on old age, and managing it with simple everyday strategies that did not break the feeling of continuity in everyday life. Not until they experienced the lack of sound as a lack of contact with life was there any interest in help in the form of hearing technology (Espmark and Scherman, 2003).

Locus of control (LOC) measures the individuals' belief in their ability to have control over what happens to them (Cox & Gray, 2005). There is a large literature exploring the relationship between LOC and reactions to stress and adversity. Associations have been reported between LOC and compliance with health care regimens (Kent, Mathews, & White, 1984; Steptoe & Wardle, 2001), distress from tinnitus and other sounds (Cox et al., 1999; Scott, Lindberg, Melin & Lyttkens, 1990), and adjustment to the limitations of aging (Hunter, Linn, Harris, & Pratt, 1980; Lachman, 1986). Garstecki and Erler (1998) found differences in LOC for hearing aid seeking behavior in the elderly, however this was only true for older women. Results revealed that women who decided to pursue amplification after a recommendation demonstrated a greater orientation toward an internal locus of control than all other study participants. This may suggest that women are more likely to assume responsibility for the management of their hearing problems. They also found that women who did not pursue amplification after a recommendation exhibited the weakest internal locus of control compared to other participants, suggesting they experienced a reduced sense of control over their hearing. In an unpublished study by Kelly-Campbell and Allan (2013), LOC was assessed through a content analysis of verbal behaviour. The results of that study indicated that participants who adopted hearing aids exhibited significantly higher internal locus of control than those who did not adopt. Conversely, participants who did not adopt hearing aids exhibited higher external locus of control, however this finding was not statistically significant. There was no significant relationship between LOC and self-perceived hearing handicap nor were any gender differences found.

1.1.6.2 Psychosocial Adjustment and Quality of Life (QoL)

Three models of psychosocial adjustment seem to dominate the literature, a) the linear or temporal model b) the cyclical or recurrent model and c) the idiosyncratic or individually-folding model (Livneh, 2001). However, the majority of existing models of adaptation to

chronic illness and disability (CID), such as HI, acknowledge the existence of a progression of individually experienced reactions. Reactions often follow a certain clinical-phenomenological course that is mostly unique to each individual. This course is determined by an interaction between several factors such as psychodynamic and disability-triggered phases of adaptation and a combination of intrapersonal (biopsychological), interpersonal (socialcultural) and extrapersonal (environmental) variables (Roessler & Bolton, 1978; Livneh, 2001). Even though there is a wide range of individual reactions to impairments, past research has identified several common reactions such as introversion, anxiety, frustration and depression (Roessler & Bolton, 1978).

The psychosocial adaptation model comprises of three broad components as shown in Figure 7.

1. Antecedents or triggering events of the disabling condition:

This includes both explicit and implicit causes and the context within which the disability has occurred.

2. The Process:

The process of psychosocial adaptation. This is a complex and interactive process which is focused on the interconnectedness of the subjectively experienced reactions to the disability (onset of hearing impairment or trauma itself, loss and stress) and a large number of medical, socio-demographic, personality and environmental variables.

3. Outcome:

The anticipated outcome of the adaptation process. Outcomes, in a general sense, can be viewed as separate indicators of quality of life. These indicators are commonly classified according to their functional or contextual domains, content areas and specific sources of outcome measurement.

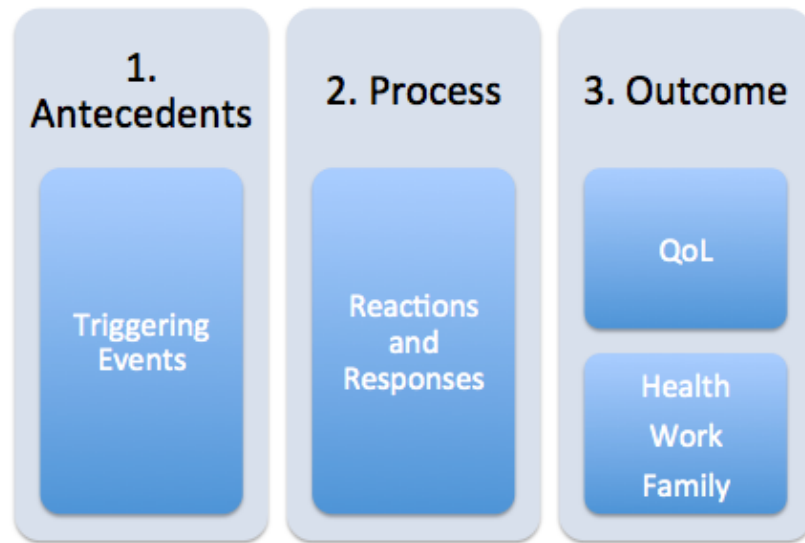


Figure 7. A model illustrating the structure, content and process of psychosocial adaptation to CID, adapted from Livneh (2001).

Acquired HI is assumed to affect activities and participation in daily social life situations in a negative way (Hallberg, Hallberg, & Kramer, 2008). This produces activity limitations and participation restrictions where hearing impaired individuals constitute a group at risk for reduced QoL as outlined in the ICF model. The above model correlates with the ICF model in that antecedents could be classified as external factors and the process could be classified as internal factors. The outcome can be seen in terms of how much participation restriction or activity limitation each individual experiences and therefore how high or low their QoL is. Hickson and colleagues (2008) reported correlations between measures of QoL and well-being and measures of activity limitation and participation restriction. Results indicate that increased activity limitations and participation restrictions are associated with reduced QoL and lower well-being. The progression of HI cannot be stopped, and therefore optimal management of this condition requires early recognition and rehabilitation, but it should also include an evaluation of QoL status in the hearing assessment process.

Some investigators have proposed including an evaluation of QoL status in the hearing assessment process (Gopinath et al., 2012; Livneh, 2001; Roessler & Bolton, 1978). Gopinath et al. (2012) observed in their study that self-perceived hearing handicap scores of individuals were a strong predictor of declining QoL among older adults. Such data suggest that audiological services should consider including, as part of their routine assessment, adequate psychometric questionnaires to explore important areas (e.g., emotional reaction to the impairment and general well-being), that may not be assessed by the current clinical approach of audiometric examinations.

In addition, relatives and other communication partners, such as SOs of individuals with HI, should be actively involved in the adjustment process and provided with training in techniques to facilitate conversation between family members and HI individuals, in order to minimize their hearing handicap and consequently improve QoL (Gopinath et al., 2012; Hallberg, Hallberg, & Kramer, 2008). Stephens et al. (1995) found that spouses report more problems with psychosocial issues and spoken communication compared with their hearing-impaired partners. As discussed earlier, there are currently only two questionnaires that have been developed as a direct measure for SOs 1) SOS-HEAR 2) HLRQoL. However, the Cognitive Anxiety Scale is a new measure which can be used to assess CA levels directly in HI individuals and SOs. The use of this measure will be discussed in more detail below.

In conclusion, psychosocial consequences of HI, such as lowered QoL, anxiety, decreased well-being, cannot be predicted from audiometric data alone (Hallberg, Hallberg, & Kramer, 2008). The individual's coping ability, such as use of communication strategies, must also be examined. The adverse relationship between maladaptive behaviour and general wellbeing in people with HI is an interesting finding from the Hallberg, Hallberg & Kramer (2008) study, which emphasizes the relevance of developing training programmes aiming to improve coping with the consequences of a HI.

As briefly mentioned above individuals with HI may experience anxiety because of their difficulties. Stephens and Héту (1991) proposed that one of the disadvantages relating to the reduced QoL experienced by a hearing impaired person is anxiety. For example, consider a person who is not able to hear warning signals or approaching vehicles in noisy traffic areas. Due to a fear of not being able to orient correctly in this situation, individuals may experience anxiety (Stephens & Héту, 1991).

1.1.7 Anxiety and Hearing Impairment

An individual with HI can experience anxiety as a physical orientation, occupation or self-sufficiency handicap. Individuals may not be actively participating in interactions with their surroundings due to a fear of not being able to successfully orient themselves in certain situations and therefore experiencing anxiety (Stephens & Héту, 1991). Furthermore, being fearful of losing one's job due to a hearing impairment can also produce anxiety and is considered as an occupational handicap (Stephens & Héту, 1991). Gatehouse (1990) found that individuals with HI who exhibited greater anxiety levels on the Eysenck Personality Inventory (Eysenck & Eysenck, 1968) tended to report greater degrees of hearing disability on the Hearing Performance Inventory. In addition, Gatehouse (1994) later found a significant relationship between individual's anxiety scores and individual's self-rated handicap scores. Anxiety accounted for nearly 10% of the variance in the social and psychological effect of experiencing difficult listening situations (Gatehouse, 1994).

It has been reported that women experience more anxiety than men (Brenes, 2006; McLean et al., 2011), particularly in the older population (de Beurs et al., 2000; Mehta et al., 2003). This gender effect has also been found in the hearing impaired population (Garstecki & Erler, 1999; Helvik et al., 2006a), yet other studies have not identified this difference (Andersson & Green, 1995; Hallberg et al., 2008; Nachtegaal et al., 2009)

Andersson and Green (1995) examined the relationship between experiences of HI and anxiety in older adults. They concluded that although anxiety scores did not correlate with audiometric testing, they did correlate with self-perceived hearing handicap. Furthermore, Saunders and Cienkowski (1996) found that anxiety accounted for nearly 14% of the variance in self-reported hearing handicap. Overall, although adults with HI do not differ dramatically from others with normal hearing on conventional anxiety measures, evidence is accruing that at least a subset of those with hearing problems experience increased anxiety, particularly when their hearing problems complicate their activity in communication situations (Kelly, Neimeyer, & Wark, 2011).

Over the years research has investigated the link between HI and anxiety and has produced mixed results. For example, Mehta and colleagues (2003) found that individuals with HI were more likely to show anxiety symptoms than individuals with normal hearing. Kent and La Grow (2007) found a significant positive correlation between anxiety and degree of HI, whereas Helvik, Jacobsen, and Hallberg (2006b) reported a trend that did not reach significance, and Nachtegaal et al. (2009) did not report an association between the two in general. However, after breaking the study sample into age groups a significant association was found between anxiety and level of HI for those aged 40 to 49 years, with no significant results for any other age group between 18 and 70 years (Nachtegaal et al., 2009). Tambs (2004) found a significant main effect for anxiety and low frequency HI only, and also noted that self-reported HI explained self-reported mental health better than audiometric results. This latter finding is in agreement with those of other studies, finding that anxiety was significantly related to perception of hearing handicap, but not audiometric results (Andersson & Green, 1995; Öberg et al., 2007). However, one limitation in many of these studies is that researchers have operationalized the construct of anxiety as a personality ‘trait’, rather than a ‘state’, and have used self-report measures that presume it is a general

characteristic of the respondent, one of which he or she is consciously aware. The purpose of this study was to examine the relationship between anxiety and HI from a different perspective. The next section will differentiate trait anxiety (general anxiety) from state anxiety (cognitive anxiety) using the personal construct theory first proposed by George Kelly (1955).

1.1.8 Personal Construct Theory and Anxiety

The Personal Construct Theory (PCT) proposed by George Kelly (1955) explains that all people are assumed to function as early scientists, who strive to develop ‘constructs’ about the events in their lives in order to understand and predict how these events will progress in the future. PCT is founded upon the notion that people’s present perceptions are subject to reconsideration and people are capable of construing in a variety of ways.

According to Kelly (1955), people think, feel and behave within the context of their construct system. Anxiety in his terms is defined in personal ‘construct’ terms. These construct systems consist of themes encountered over a lifetime of events. However, a construct system is only useful in anticipating a limited range of circumstances (Kelly, 1955). Even though people seek to develop useful construct systems, no construct system is able to encompass the entire range of human events and anxiety is experienced when people become aware that current events lie mostly outside the construct’s useful range, termed the “range of convenience.” (Bannister, 2003). In summary, people experience anxiety when they are confronted with events that their construct system is not equipped to make sense of and accurately predict, for example an individual who is getting the diagnosis of a permanent HI.

Another similar definition of anxiety has also been proposed by Paul McReynolds (1962). Anxiety in his terms occurs when people develop a cognitive structure which represents their world view. Hence, when new experiences occur, reorganisation is required

in order for those perceptions to be adjusted into the cognitive structure. Thus, if this cannot occur, the individual will experience anxiety (McReynolds, 1962).

Additionally, Epstein (1972) has also considered cognitive incongruity to be related to anxiety. He defined this kind of anxiety as a highly diffuse physiological arousal due to the inability to integrate experience meaningfully. This is also confirmed by Lazarus (1968) for whom cognitive appraisal is a necessary part of coping with stress. He considered that anxiety could be the result of not knowing what to do next (similar idea to those of Epstein). Overall, it has been reported that non-confirmation of expectancies induces anxiety (Hebb, 1966; McClelland, Atkinson, Clark, & Lowell, 1953; Mussen, Conger, & Kagan, 1963).

Uncertainty has frequently been linked with anxiety in the literature (D'Amato & Gumenick, 1960; Pervin, 1963; Lovibond, 1968; Monat, Averill, & Lazarus, 1972). The researchers cited above have demonstrated that uncertainty about painful shock delivery leads to higher levels of anxiety. In addition, Brenner, Feldstein & Jaffe (1965) demonstrated the contribution of uncertainty to anxiety-related speech disruption. Furthermore, Champion (1950), Bowers (1968), Corack & Boffa (1970) and Houston (1972) have all shown that perceived control of the stressor leads to lower levels of anxiety. This is perhaps because it brings the stressful event which lies outside ones personal construct within ones range of convenience, and thus gives them more cognitive control (Viney & Westbrook, 1976).

This brief summary underlines the importance of developing a viable measure of cognitive anxiety (CA). As Kelly (1955) described, CA consists of awareness that an experience is outside the range of convenience of the present construct system. For example, if a HI individual has the belief that her hearing is not impaired but going to the audiologist confirms that she has a permanent HI, this falls outside the range of convenience for her construct system and thus she will experience CA.

1.1.8.1 Cognitive Anxiety & Cognitive Anxiety Scale

The present study examined the concept of anxiety from a perspective that is different from the way it has traditionally been viewed in the audiology literature. Anxiety was operationalized with precepts drawn from Kelly's PCT and was measured using the Cognitive Anxiety Scale (CAS; Viney & Westbrook, 1976), a measure of transient, state anxiety.

Anxiety has been considered to have two components, state anxiety versus trait anxiety. Spielberger (1966) suggested that conceptual anxiety could be defined by distinguishing trait anxiety from state anxiety. He defined trait anxiety (A-Trait) as an individual's predisposition to respond, and state anxiety (A-State) as a transitory emotion characterized by physiological arousal and consciously perceived feelings of apprehension, dread, and tension. He describes this to be "a complex, relatively unique emotional condition or reaction that may vary in intensity and fluctuate over time" (p. 29). Personality states, such as A-State, refer to overt reactions or processes, while personality traits, such as A-Trait, refer to latent dispositions to respond with certain reactions (Spielberger, 1972).

The Cognitive Anxiety Scale (CAS), which was developed by Viney and Westbrook (1976), measures the extent to which an individual experiences CA as defined within PCT. CA is an operationalization of anxiety from the PCT perspective. Viney and Westbrook (1976) theorized that people seem to experience CA when they are unable to fully construe events they encounter especially when the implications of these events are not clear. It was apparent during the development of this scale that CA correlated better with measures of 'state' anxiety, as opposed to measures of 'trait' anxiety. Thus, it is evidence for the construct of CA being the "inability to anticipate and integrate experience meaningfully" (p. 148).

The CAS is a content analysis scale, which is designed to measure the psychological, transitory state of CA. This scale can be tailored to permit coding of the content of

participants' descriptions of their experience. The benefits of using content analysis rather than a standardized questionnaire are that it does not rely on participants' self-awareness of feeling tense or nervous, and it is by definition relevant to their personal concerns (Kelly, Neimeyer, & Wark, 2011). In summary, the CAS allows participants to respond to elicitation questions that relate directly to their experience as individuals living with HI rather than a more traditional assessment of anxiety.

As discussed above, CA refers to a transitory state of anxiety rather than a personality trait. The content analysis of verbal behavior has been used in psychology to assess transitory psychological states (Viney, 1983). The underlying assumption of content analysis is that the way people choose to express themselves reflects the nature of these psychological states. Gottschalk & Gleser (1969) provided eight steps that need to be taken into account when constructing a content analysis scale:

1. the researcher must describe and define the dimensions of the psychological state under investigation – in our case CA
2. the researcher must define the unit of the content to be analysed. For the CAS, the unit is the clause defined as a segment of language that contains an active verb.
3. The third step involves specifying the cues referring to the content of the verbal communications from which the psychological state will be inferred.
4. Fourthly, the researcher needs to specify the intensity of the psychological state based on those cues.
5. This step involves applying weights to these cues. Details of the specification of content and intensity of the cues for CAS will be described.
6. This step involves including a correction factor to account for the number of words in each sample (Gottschalk & Gleser, 1969). For the CAS, the

correction factor is calculated by dividing the total number of words in each sample by 100.

7. In this step a score is derived. For the CAS the distribution of scores was found to be positively skewed, so square root transformations are applied to the score (Viney & Westbrook, 1976).
8. Finally, the researcher must establish normative data from specified samples of people and situations. The normative data for the CAS was collected for five samples (Viney & Westbrook, 1976).

Viney & Westbrook (1976) specified the content and intensity of the cognitive anxiety cues for the CAS. First, they outlined three non-mutually exclusive scoring categories for each unit as shown in Table 1.

Table 1: *Cognitive Anxiety Categories and Weights (Viney & Westbrook, 1976)*

Code	Weight	Category
Ca3	3	Cognitive Anxiety experienced by self
Cb2	2	Cognitive Anxiety experience by others
Cd1	1	Cognitive Anxiety expressed but denied

In addition, Viney & Westbrook (1976) also provided guidelines for scoring clauses according to the categories. Each clause can only be scored once and should only receive one score. When one clause amplifies another, each clause needs to be scored independently. One

additional weighting point is given to a clause when it contains emphasis such as an adjective modifier or repetition. CA should be scored when a clause indicates difficulty in comprehension. CA should also be scored when the clause indicates, either implicitly or explicitly, that an experience was not meaningfully integrated. Furthermore, CA should be scored when surprise in a clause reflects a prediction that was not accurate.

Questions that indicate a lack of understanding are scored as indicators of CA, but questions that simply request information are not (Viney & Westbrook, 1976). For example, the statements such as “I don’t know” and “I don’t know what to say” are indicative of CA and are scored. However, the statement “I don’t know what else to say” is not scored. Because some words can imply CA in some contexts and not in others, a CA score is given to the clauses containing these words only when anxiety is implicit in the context. If the clause contains any reference to the first person, such as with the use of the pronouns “I”, “we” or “me”, it is classed and coded as Ca3, reflecting CA that is experienced by the self. However, if the clause is a generalization such as “they”, it is coded as Cb2, reflecting CA that is experienced by others. Denial (Cd1) of CA is only coded if specifically expressed or stated. Denial that is implicit is not coded. Similarly, if a response is omitted by choice, it is not coded. However, CA is scored if the clause reflects an unavailability of response or if the response is not in the repertoire of the respondent. Finally, references to forgetting or not remembering are not scored. After the clauses are scored, the CA score is calculated according to formula as seen in Equation 1.

$$CAS\ score = \sqrt{(Frequency \times Weight)C.F. + \frac{1}{2}C.F.}$$

Equation 1. Cognitive Anxiety Scale score formula

In summary, the CAS, which has been used to measure CA in individuals with HI and their SO, differs from general anxiety in the audiology literature as this scale measures state anxiety rather than trait anxiety. The CAS is a content analysis measure where individuals respond to elicitation questions rather than responding to self-assessment questionnaires. Each individual response is then coded and scored for evidence of CA. Using this method allows the participant to respond to questions that directly relate to their experience rather than a more generic assessment of anxiety.

In recent years the CAS has been applied to the field of communications disorders. DiLollo, Manning, & Neimeyer (2003) used the CAS to investigate the meaningfulness of both fluent and non-fluent speaker roles with individuals who stutter. Results revealed that individuals who stutter demonstrated greater difficulty meaningfully integrating their experiences when in the fluent speaker role than when in the non-fluent speaker role. Conversely, fluent speakers demonstrated greater difficulty meaningfully integrating their experiences when in the non-fluent speaker role than when in the fluent speaker role.

1.1.8.2 Cognitive Anxiety and Hearing impairment

Recently research in audiology has focused on the relationship between anxiety and adjustment to HI rather than its traditional focus on assessment and hearing remediation (Kelly et al., 2011). This relationship has been found to be one potential factor that may drive people to seek services for their hearing impairment. Past research has been limited in the sense that many of these studies have implied the construct of anxiety as a personality '*trait*' rather than a '*state*', and have used self-report measures that presume that this is a general characteristic of the person, one of which he or she is consciously aware. As mentioned earlier, Kelly's theory of personal constructs (1955) explains that all people are assumed to function as early scientists who strive to understand, predict and in some measure control their worlds and perhaps even most critically their 'relationship' with significant others.

Anxiety in his terms is defined in personal construct terms. The awareness that the events with which one is confronted lie mostly outside the range of convenience of his or her construct system can trigger anxiety (Kelly, 1955). Therefore, if people's personal constructs prove to be insufficient they experience a transient state of predictive uncertainty, CA.

It is likely that a person with a HI will experience CA because a person with HI has reduced access to the auditory signal and is therefore more likely to have difficulty knowing when people are speaking or what they are saying. This, in turn, makes it difficult to anticipate and participate meaningfully in social interactions that involve communication (Kelly et al., 2011). The person is only aware of the instances when speech is audible and is unaware of the instances when speech was not audible. To the person with hearing impairment, it is difficult to predict when the communication will break down because of what is not being heard. This uncertainty gives rise to a *state* (not necessarily a *trait*) of anxiety in such circumstances (Viney & Westbrook, 1976). Anxiety can therefore serve a function, as one of the factors that drives people to seek services for their hearing impairment.

Kelly et al. (2011) provided research supporting the idea that anxiety leads people to seek services for HI. They used the CAS in order to examine the relationship between anxiety and HI from a different perspective, a perspective first implicated by Kelly (1955). Three groups of older adults occupying different points in the consultation process were investigated: (a) a non-consulting group living in the community, (b) a consulting group seeking evaluation and treatment for hearing impairment, and (c) a group who had received communication consultation and hearing aids. Results show that those who were actively seeking consultation for HI displayed the highest level of CA, and those who had received consultation and assistance the least. This indicates that for older adults, CA may play an instigating role in the decision to seek services for HI.

Limitations of the study included that all of the participants were part of a larger study and therefore, it was not possible to determine the extent to which participation in that study may have influenced participants' CAS scores. Furthermore, the number of male participants was greater than the number of females in each group, reflecting the different base rates for HI for older men and women. Although the ratio of men to women did not differ across the three groups, the smaller number of women in the study made it infeasible to evaluate whether the experience of CA is different for the two genders. The researchers proposed that it is possible that men and women may experience communication situations differently and relate differently to issues of stigma implicit in their identity-defining "core role" constructs and further studies are needed to evaluate such possible gender effects.

Kelly (in review) shows that for older adults, CA changes throughout the consultation process. In her study CA was measured three times for a single group of older adults as they moved through the consultation process (a) pre-consultation, (b) initial consultation, and (c) 6 months post-hearing aid fitting. Results show that CA was the greatest at the initial consultation and lowest at 6-months post-fitting. In addition, results indicate gender differences in CAS levels. Cognitive Anxiety was greater for male participants than female participants at initial consultation (when CA was the greatest for all participants) but there were no significant gender differences at pre-consultation nor at 6 months post-fitting (when CA was the least for all participants). However, not much research has been conducted with younger adults and with significant others.

Significant others can and may occupy various roles in the lives of hearing impaired individuals (Kelly, 2005). Kissling and colleagues (2003) argued for the inclusion of significant others at all stages in the audiological rehabilitation process and suggest that significant others may serve as a potential barrier to older people seeking help for their hearing problems. The perception of communication problems of significant others is not the

same as for individuals with hearing impairment. Chmiel and Jerger (1993) found that the average handicap of the hearing impaired individual perceived by the significant other was significantly greater compared to the average handicap perceived by the hearing impaired individual. In addition, significant others tended to underestimate communication importance and tended to be less aware of their partners' use of communication strategies. Significant others also tended to overestimate their partners' degree of self-acceptance (Erdman & Demorest, 1996).

The perception of hearing problems and the consequences of those problems are not the same for individuals with hearing impairment and their significant others, hence, Jones and Getty (1993) argued that a two-sided analysis is needed to investigate and examine the perception of difficulties encountered by both communication partners. Therefore, more research in this area is needed in order to understand the role of the significant other in the audiological process.

1.1.9 Aims and Hypotheses

The aim of this study was to examine cognitive anxiety levels of first-time hearing aid users and their significant others before, during and after hearing aid fitting. The following research questions have been addressed:

1. (a) Do cognitive anxiety levels change in individuals with hearing impairment as they go through the consultation process?
(b) Is there any difference in cognitive anxiety levels between male and female participants with hearing impairment as they go through the consultation process?
2. (a) Do cognitive anxiety levels change in normal hearing significant others of individuals with hearing impairment as they go through the consultation process?
(b) Is there any difference in cognitive anxiety levels between male and female significant others as they go through the consultation process?

3. (a) Do cognitive anxiety levels differ between participants with hearing impairment who adopt amplification and those who do not?
- (b) Do cognitive anxiety levels of significant others differ between participants with hearing impairment who adopt amplification and those who do not?

The following hypotheses were investigated:

1. For participants with hearing impairment who adopt hearing aids,
 - (a) CAS scores will be significantly higher at first consultation (interview 1) than at the second interview and third interview and CAS scores will be significantly higher at the second interview than the third interview,
 - (b) there will be no significant differences between female and male HIA CAS at any time.
2. For significant others of participants who adopt hearing aids,
 - (a) CAS scores will be significantly higher at first consultation than at the second interview and the third interview and CAS scores will be significantly higher at the second interview than the third interview,
 - (b) there will be no significant differences between female and male SO CAS at any time.
3. For all participants with hearing impairment,
 - (a) CAS scores will be significantly higher at the initial consultation for participants with hearing impairment who adopt hearing aids than for participants with hearing impairment who do not adopt hearing aids,

(b) there will be no significant differences between SO CAS scores between adopters and non-adopters.

2 Method

2.1 Priori Power Analysis

It was decided that an effect size of 0.50 and above could constitute a “clinically significant” effect. An *a priori* power analysis (Portney & Watkins, 2009) was conducted for this study. By referring to sample size tables, it was determined that in order to be able to detect clinically significant effects, a minimum of 16 participants would be necessary.

2.2 Recruitment Sites and Participant Recruitment

Seven audiology clinics in Christchurch were approached and asked if they would consider being involved in the study. The manager at each clinic was emailed a letter detailing the study in addition to a flow chart which detailed the inclusion and exclusion criteria for participants (see Appendix 1). Two days after sending out emails to each audiology clinic, a visit was scheduled with the front desk staff and charge audiologist in order to describe the study and answer any questions in regards to participant recruitment. Prior to commencing recruitment, a presentation was made to each clinic that agreed to participate. The goal of the presentation was to explain the study procedures and to facilitate participant recruitment. If the clinic agreed to participate a contact sheet was left with the clinic staff to put the names and number down for each patient that was willing to participate. Twice a week, this contact sheet was collected from each clinic and patients that met the inclusion criteria were invited to participate. Four clinics in Christchurch agreed to be involved in the study. Based on sample size calculations and time constraints of conducting thesis research, the initial aim was to recruit 20 couples (40 participants) over a six-month period. Despite these efforts, recruitment was considerably slower than anticipated. After four months of recruitment, only eight couples had agreed to participate. It is unknown whether the slow recruitment was due to clinicians forgetting or choosing not to mention the

study to patients, clinicians having insufficient time to discuss the study, clients not meeting the inclusion criteria or not being interested in participating.

Initially the clinics involved were Christchurch-based so that the interviews could be conducted face-to-face. However due to slow recruitment, other clinics nationwide including Timaru and Auckland were approached and asked to be involved in the study, with the plan of doing phone interviews. This additional effort resulted in a total of eight clinics being involved in the study. Despite the additional clinics, the rate of recruitment was still relatively slow and a total of 34 participants were recruited over a nine-month period in addition to the five participants for the pilot data.

2.3 Participants

A quotas sampling strategy was used to recruit a total of 39 adults, 17 couples in addition to five participants for the pilot study. Five hearing impaired adults were used in a pilot study that ensured that the scoring guidelines used by the study researchers were appropriate for a New Zealand population. The remaining 17 couples with hearing impairment and their significant others comprised the participants for the study. Overall, nine hearing impaired participants decided to adopt hearing aids (adopter group) and eight participants decided to not adopt hearing aids (non-adopter group).

Inclusion criteria for Hearing Impaired Participants (HI):

- 1) adults over the age of 30 over the age
- 2) have a permanent adult-onset hearing impairment (SNHI, CHI, mixed HI, unilateral or bilateral HI) (i.e., hearing impairment first noticed after the age of 30 years).
- 3) never used hearing aids previously
- 4) have a significant other who is defined as being in a committed relationship for at least the past year.

Exclusion criteria for HI:

- 1) must not have a sudden or profound hearing impairment with a Pure Tone Average (PTA) > 90 dBHL)
- 2) must not report experiencing moderate or greater tinnitus.

Inclusion criteria for significant others (SO):

- 1) must be in a committed relationship with the participant for at least the past year
- 2) must be at least 18 years of age.

Exclusion criterion for SO:

- 1) must not have greater than a mild hearing impairment (no greater than 40 dBHL across the frequency range of 500 Hz - 8000 Hz).

A four-frequency PTA (PTA4) was used to calculate each participant's average hearing thresholds. Individuals with a unilateral HI were included in this study because some of these individuals choose to wear hearing aids.

2.4 Procedure and Materials

All hearing participants who self-identified as having a hearing impairment received a full audiologic evaluation in a double walled sound-attenuating booth. All significant others received a screening test in order to confirm hearing was within normal limits or that they exhibited no greater than a mild hearing loss. All participants and their significant other who adopted hearing aids were scheduled for three data collection interviews. As seen in Figure 8, the first interview was conducted on the same day of the full hearing assessment, before participants consulted with the audiologist at the clinic. The second interview was conducted on the day of the second follow up appointment with the audiologist. Overall, the time between the first interview and the second interview ranged between 18-166 days. This wide range was due to other arrangements participants had made, such as going on holiday. In

addition, some participants could not make a decision to adopt hearing aids on the day they received a hearing evaluation and therefore made the decision to trial hearing aids after a few days or sometimes even weeks. The third and final interview was conducted between 29-31 days after participants' finalise appointment (within 21 and 120 days after the second interview) in which they decide if they want to keep the hearing aid(s) or not. Again such a wide range was due to several reasons. Participants were recruited from several different clinics, and each clinic had their own protocols. One of the clinics offered only two follow up appointments for their clients whereas other clinics offered a minimum of 3 follow up appointments before the client had to make a decision to adopt the hearing aid(s) or not.

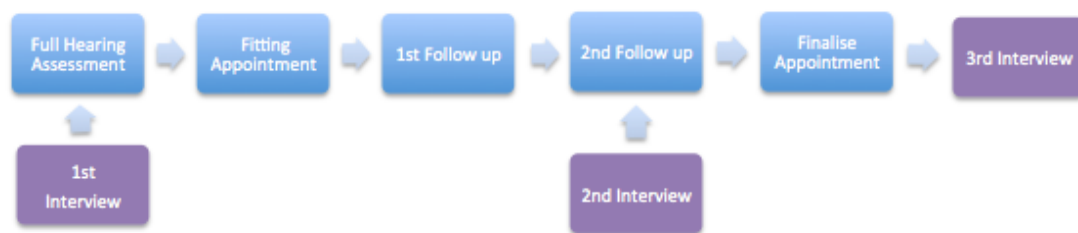


Figure 8. Flowchart illustrating the hearing aid fitting process including interview sessions

Most participants were interviewed in a quiet consultation room in order to obtain data for the content analysis. However, due to scheduling issues some of the interviews were conducted via phone. Table 2 below illustrates how many phone interviews were conducted between adopters and non-adopters and at which interview session. Overall, 60 interviews were conducted, 20 of which were conducted by phone and 40 face to face.

Table 2: *Number of Phone Interviews*

	First interview	Second interview	Third interview
AD	4	4	4
NA	8		

Note. AD = Adopters, NA = non-Adopters

Interviews were recorded on an Olympus Digital Voice Recorder WS-110. Elicitation prompts were derived from Viney and Westbrook (1976) and participants were asked to respond to the following prompt question:

Unstructured Interview Question Prompt for Adults with Hearing Impairment:

“Thank you for agreeing to talk with me about your experience. I want to make sure I fully understand your experience, so I’m going to record this interview. I’d like you to talk to me for about 5 minutes about what it is like for you, as a person with hearing problems, in everyday life situations. Once you start talking, I’ll be here listening to you; but I’d rather not reply to any questions you may have until 5 minutes are over. Do you have any questions now, before we begin?”

Unstructured Interview Question Prompt for Significant Other of Adults with Hearing Impairment:

“Thank you for agreeing to talk with me about your experience. I want to make sure I fully understand your experience, so I’m going to record this interview. I’d like you to talk to me for about 5 minutes about what it is like for you, as a significant other living with someone who has a hearing problem? Once you start talking, I’ll be here listening to you; but I’d rather not reply to any questions you may have until 5 minutes are over. Do you have any questions now, before we begin?”

Participant responses were transcribed verbatim and the transcripts were stored in a word processing document. Because this data for the Cognitive Anxiety Scale has not previously been used in a New Zealand population, pilot data were collected to ensure the established scoring guidelines (DiLollo, Manning, & Neimeyer, 2003) used in other populations could be used reliably. Pilot data were collected for five adults with hearing impairment living in New Zealand. The researcher and her supervisor used the established

scoring guidelines to score the pilot data. The established criteria for identifying clauses and scoring guidelines with examples are shown in Table 3. After scoring the pilot data, it was determined that the established scoring guidelines could be used reliably within the New Zealand context. A discussion of the measures of reliability follows in the next section.

Table 3: *Criteria and Guidelines for identifying and scoring clauses (Kelly, Neimeyer, & Wark, 2011)*

<i>Criteria for identifying clauses</i>	<i>Examples</i>
Expression of complete thought	“I’ve had a hearing problem since childhood” “Now I can hear”
Contains noun and verb	“and that would upset me” “as I look back on it”
Contains unique thought	“which is so stupid” “and also in a restaurant”

Guidelines for scoring clauses

- 1) Score each clause only once.
- 2) When a clause emphasizes another clause, score it separately.
- 3) Score a clause when it indicates *difficulty in comprehension*.
- 4) Score a clause when it implies that experience was *not meaningfully integrated*.
- 5) Score a clause when it implies *little or no experience* with topic.
- 6) Score a clause if it reflects *uncertainty* about topic.
- 7) Score a clause if it implies feelings of *guilt or deception* related to topic.
- 8) Score a clause if it implies *denial* of topic.
- 9) Score a clause if it directly states the individual can *only speculate* about topic.
- 10) Don’t score a clause when the speculation is implied or unclear.
- 11) Score a clause when it indicates *surprise that is interpreted as meaning the prediction was inaccurate*.
- 12) Score a clause when it reflects a question that indicates a *lack of understanding*.
- 13) Score a clause when it reflects a question that is a *whole or partial repetition* of the original question.
- 14) Don’t score a clause when it is merely requesting information.
- 15) Score a clause when a cognitive response was *not available* or *not in the person’s repertoire*.
- 16) Don’t score a clause if the response was omitted by choice.
- 17) Don’t score a clause if the response refers to forgetting or not remembering.
- 18) Don’t score the clause “I don’t know what else to say.”

Using these established guidelines, each transcript was analysed to define clauses, score the clauses, and apply a weighting to the scored clauses. The first step in analyzing the

transcripts was to identify clauses. The purpose of this step was to divide the transcript into units for analysis. A clause is a complete expression of thought, a segment of the transcript that contains a noun and a verb, or any segment of language that contains a complete thought. After the clauses were identified, they were examined for evidence of cognitive anxiety. When there was evidence of cognitive anxiety, the clause received a score. Each clause was scored only once, following the established guidelines. Finally, each scored clause was assigned a weight. The subject of the clause determined the weighting. An example of such analysis can be seen in Appendix 2.

In addition, approximately 20% of all transcripts for each group, significant others or hearing impaired participants, were randomly selected and coded by the researcher's supervisor in order to measure the reliability in the scoring. For this study, reliability was calculated by using intraclass correlation (ICC) in addition to Cronbach's alpha (α) using the Statistical Package for the Social Sciences (SPSS) v. 20. Cronbach's alpha measures the extent to which a group of values measure a single thing (e.g., cognitive anxiety). The alpha value can range from 0 to 1. The higher the value, the higher the internal consistency and the more likely the group of values are measuring a single thing. The Cronbach's alpha for the two coders was .979, which demonstrates excellent agreement. Another more common way to measure reliability is through intra-class correlation coefficient (ICC). ICC is a measure of the extent to which two raters make the same assessment of the same observation. ICC values also range from 0 to 1, with higher values indicating less variation between the scores given to each item by the raters. The ICC value for the two coders was .959, which can be classified as excellent agreement between coders.

Furthermore, a Cohen's d was used to convey effect size. This is a measure of strength between two variables. An effect size calculated from a set of data is a descriptive statistic that conveys the estimated magnitude of a relationship without making any statement

about whether the apparent relationship in the data reflects a true relationship in the population. In that way, effect sizes complement inferential statistics such as p-values. A larger effect size generally means a greater chance of identifying a significant difference between two groups, along with greater statistical power (Lipsey, 1990). Cohen (1977, 1988) identified categories of magnitude for effects considered “small: $d = .20$ ”, “medium: $d = .50$ ” and “large: $d = .80$. The higher the effect size is, the higher the magnitude of relationship between two variables.

Each participant was given an information sheet (Appendix 3) and after agreeing to participate in the study each individual filled out a separate consent form (Appendix 4). The consent form was the only form that contained the participant’s name; all other documents were labeled with an identification number to ensure anonymity. Furthermore, for confidentiality, the clinic that the participant attended and the name of the audiologist that they saw was not recorded on the forms.

2.5 Statistical analyses

Analysis 1: A Wilcoxon signed ranks test for related samples was used to test Hypothesis 1a: For HIA who adopt hearing aids, CAS scores will be significantly higher at interview 1 than interview 2 and 3, and CAS scores will be significantly higher at interview 2 than at interview 3.

Analysis 2: Mann-Whitney U tests for independent samples was used to test Hypothesis 1b: There will be no significant differences in CAS scores between female and male HIAs in the adopter group at any time.

Analysis 3: A Wilcoxon signed ranks test for related samples was used to test Hypothesis 2a: For SO of participants who adopt hearing aids, CAS scores will be significantly higher at first consultation than at the second interview and the third interview, and CAS scores will be significantly higher at interview 2 than at interview 3.

Analysis 4: Mann-Whitney U tests for independent samples was used to test Hypothesis 2b: There will be no significant differences in CAS scores between female and male SOs in the adopter group at any time.

Analysis 5: A Mann-Whitney U test for independent samples was used to test Hypothesis 3a: CAS scores will be significantly higher at the initial consultation for HIA who adopt hearing aids than for HIA who do not adopt hearing aids.

Analysis 6: A Mann-Whitney U test for independent samples was used to test Hypothesis 3b: There will be no significant differences between SO CAS scores between adopters and non-adopters.

2.6 Ethical Considerations

Ethical approval was granted by the University of Canterbury Human Ethics Committee on 31 October 2011, as seen in Appendix 5. All procedures conducted during this study were in accordance with this approval. Informed consent forms were signed by all participants.

3 Results

3.1 Sample Characteristics

Overall, 17 couples ($n = 34$) agreed to participate in this study. Nine out of the 17 hearing impaired participants chose to adopt hearing aids, leaving eight non-adopters. Tables 1 and 2 provide a general overview of the data for hearing impaired adults (HIA) and significant others (SOs) within the adopter and non-adopter groups. The analyses testing the study hypotheses were carried out on a small sample. This, coupled with the non-Gaussian distribution and use of non-parametric statistics resulted in statistical analyses that are underpowered. Nevertheless, the analyses will be reported and special attention will be paid to the effect sizes for these analyses. Table 4 and Table 5 illustrate the sample characteristics of HIA and SOs in the adopter group, and HIA and SOs in the non-adopter group.

Table 4: *Sample Characteristics of Adopters, HIA ($n = 9$) and SO ($n = 9$)*

	HIA					SOs				
	Age	PTA4	CAS1	CAS2	CAS3	Age	PTA4	CAS1	CAS2	CAS3
Mean	74.44	34.24	1.02	0.99	0.72	74.55	18.68	0.97	1.16	0.89
SD	8.32	8.66	0.19	0.28	0.15	10.78	10.65	0.28	0.31	0.23
Median	78	32.5	1.08	1.03	0.72	79	23.75	0.92	1.24	0.80
Min	60	21.25	0.61	0.41	0.51	55	1.87	0.68	0.65	0.63
Max	85	46.88	1.29	1.34	0.94	87	30	1.60	1.55	1.21

Note. PTA4 = Pure-tone average at 500Hz, 1kHz, 2kHz & 4kHz; CAS1 = Initial Cognitive Anxiety Score (1st interview); CAS2 = Cognitive Anxiety Score on 2nd interview; CAS3 = Cognitive Anxiety Score on 3rd interview; HIA= Hearing Impaired Adults; SOs = Significant Others

Table 5: *Sample Characteristics of non-Adopters HIA (n = 8) and SOs (n = 8)*

	HIA			SOs		
	Age	PTA4	CAS1	Age	PTA4	CAS1
Mean	63.25	25.94	0.93	61.12	12.14	0.99
SD	7.94	8.19	0.17	12.60	6.10	0.29
Median	63	25.31	0.87	61	11.25	0.93
Min	49	15	0.74	36	3.75	0.65
Max	72	41.25	1.15	75	20.62	1.44

Note. PTA4 = Pure-tone average at 500Hz, 1khz, 2khz & 4khz, CAS1 = Initial Cognitive Anxiety Score (1st interview), HIA= Hearing Impaired Adults, SOs = Significant Others

3.2 Analysis 1: CAS for Hearing Impaired Adults

The following analysis includes all adopting hearing impaired adults (HIA) (n = 9). HIA were predicted to experience greater levels of cognitive anxiety at the initial interview (CAS1) than at the second interview (CAS2) and third interview (CAS3) and to experience significantly greater levels of cognitive anxiety at the second interview (CAS2) than at the third interview (CAS3). The means and standard errors of the CAS scores for HIA for the three interview times are shown in Figure 9.

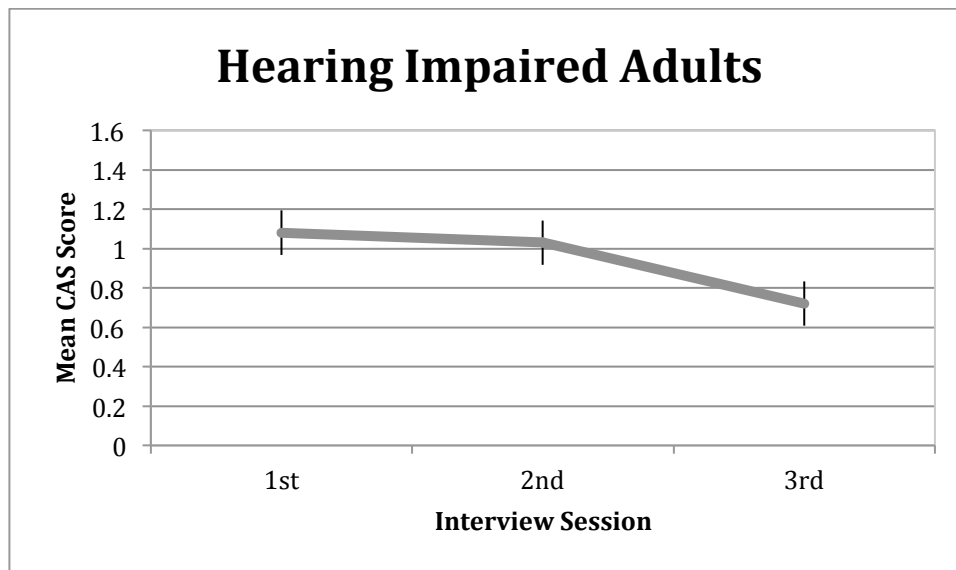


Figure 9. Mean Cognitive Anxiety Scale (CAS) scores and standard errors for Hearing Impaired Adults for the three interview times.

The Wilcoxon signed-ranks tests (Z) for related samples (1-tailed) partially supported this hypothesis. For HIA, there was no significant difference between CAS scores between the first interview (CAS1) and the second interview (CAS2): $Z = .415$, $p = .678$, $d = .12$. However, CAS scores were significantly higher at the first interview (CAS1) than at the third interview (CAS3): $Z = 2.547$, $p = .011$, $d = 1.75$. In addition, CAS scores were significantly higher at the second interview (CAS2) than at the third interview (CAS3): $Z = 2.073$, $p = .038$, $d = 1.20$. The effect sizes indicate there was a sizable decrease in cognitive anxiety over time.

3.3 Analysis 2: Gender differences in CAS for Hearing Impaired Adults

The following analysis includes all adopting hearing impaired adults (HIA) ($n = 9$). It was predicted that there would not be a significant difference between female and male HIA CAS scores at any interview time. The means, medians and standard deviations for the female and male HIA for the three interview times are shown in table 6.

The Mann-Whitney U-tests for independent samples (2-tailed) supported this hypothesis, however, an examination of the effect sizes indicates the analyses were underpowered. For HIA, there was no statistically significant difference between female and male CAS scores at first interview (CAS1): $U = 6.00$, $p = .327$, $d = 0.756$. Similarly, there was no statistically significant difference between female and male HIA CAS scores at the second interview (CAS2): $U = 8.00$, $p = .624$, $d = 2.45$, and no statistically significant difference between female and male HIA CAS scores at the third interview (CAS3): $U = 4.50$, $p = .176$, $d = 1.06$. However, the Cohen's d effect sizes indicate that while statistical significance was not reached, there may be a clinically significant effect of gender on CAS scores for HIA, females may experience more CA levels compared to males.

Table 6: Means, medians and standard deviations of the Cognitive Anxiety Scale (CAS) for female and male participants with hearing impairment (HIA) for the three interview times.

	N	Mean	Median	Standard Deviation
Female HIA				
CAS1	4	0.95	1.04	0.23
CAS2	4	1.05	1.06	0.25
CAS3	4	0.79	0.82	0.05
Male HIA				
CAS1	5	1.08	1.08	0.14
CAS2	5	0.94	1.03	0.33
CAS3	5	0.65	0.58	0.17

Note. CAS1 = Initial Cognitive Anxiety Score (1st interview), CAS2 = Cognitive Anxiety Score at the second interview, CAS3 = Cognitive Anxiety Score at the third interview.

3.4 Analysis 3: CAS for Significant Others

The following analysis includes all significant others (SOs) of adopting hearing impaired adults ($n = 9$). SOs were predicted to experience greater levels of cognitive anxiety at the initial interview (CAS1) than at the second interview (CAS2) and third interview (CAS3) and to experience significantly greater levels of cognitive anxiety at the second interview (CAS2) than at the third interview (CAS3). The means and standard errors of the CAS scores for HIA for the three interview times are shown in Figure 10.

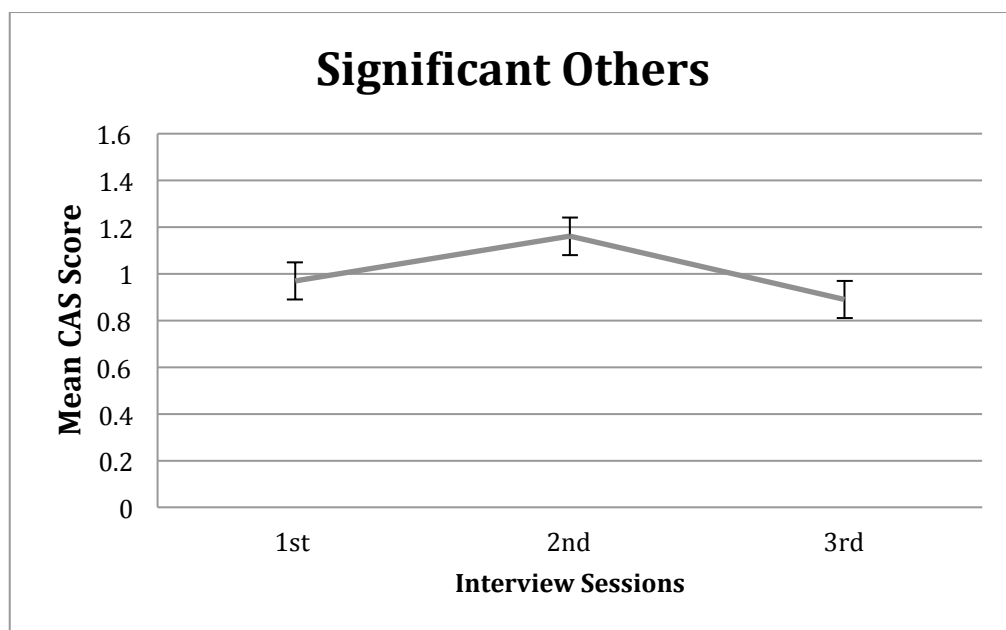


Figure 10. Mean Cognitive Anxiety Scale (CAS) scores and standard errors for Significant Others for the three interview sessions.

The Wilcoxon signed-ranks tests (Z) for related samples (1-tailed) partially supported this hypothesis. For SOs, there was no statistically significant difference between CAS scores at the first interview (CAS1) compared with the second interview (CAS2): $Z = 1.244$, $p = .214$, $d = .63$ nor compared with the third interview (CAS3): $Z = .296$, $p = .767$, $d = .31$. However, CAS scores were significantly higher at the second interview (CAS2) compared to the third interview (CAS3): $Z = 2.073$, $p = .038$, $d = .98$. An examination of the Cohen's d

effect sizes, indicates that for SOs, there was a sizeable increase in cognitive anxiety from the first to the second interview, and a sizeable decrease from the second to the third interview.

3.5 Analysis 4: Gender differences in CAS for Significant Others

The following analysis includes all significant others (SOs) of adopting hearing impaired adults ($n = 9$). It was predicted that there would not be a significant difference between female and male SOs CAS scores at any interview time. The means, median and standard deviations for the female and male SOs for the three interview times are shown in table 7.

The Mann-Whitney U-tests for independent samples (2-tailed) supported this hypothesis, however, an examination of the effect sizes indicates the analyses were underpowered. For SOs, there was no statistically significant difference between female and male CAS scores at first interview (CAS1): $U = 7.00$, $p = .462$, $d = 0.756$. Similarly, there was no statistically significant difference between female and male SOs CAS scores at the second interview (CAS2): $U = 6.00$, $p = .327$, $d = 0.647$, and no statistically significant difference between female and male SOs CAS scores at the third interview (CAS3): $U = 8.00$, $p = .624$, $d = 0.175$. However, the Cohen's d effect sizes indicate that while statistical significance was not reached, there may be a clinically significant effect of gender on CAS scores for HIA.

Table 7: Means, medians and standard deviations of the Cognitive Anxiety Scale (CAS) for female and male significant others (SOs) for the three interview times.

	N	Mean	Median	Standard Deviation
Female SOs				
CAS1	5	0.89	0.91	0.17
CAS2	5	1.24	1.26	0.35
CAS3	5	0.87	0.78	0.25
Male SOs				
CAS1	4	1.06	1.00	0.38
CAS2	4	1.07	1.12	0.25
CAS3	4	0.92	0.89	0.22

Note. CAS1 = Initial Cognitive Anxiety Score (1st interview), CAS2 = Cognitive Anxiety Score at the second interview, CAS3 = Cognitive Anxiety Score at the third interview.

3.6 Analysis 5: CAS for Adopting and Non-Adopting Hearing Impaired Adults

The following analysis includes all hearing impaired adults: adopting (n = 9) and non-adopting (n = 8). It was predicted that there would be a significant difference between adopting HIA and non-adopting HIA CAS scores at the initial interview. The means and standard errors of the CAS scores for adopting and non-adopting HIA at the initial interview are shown in Figure 11.

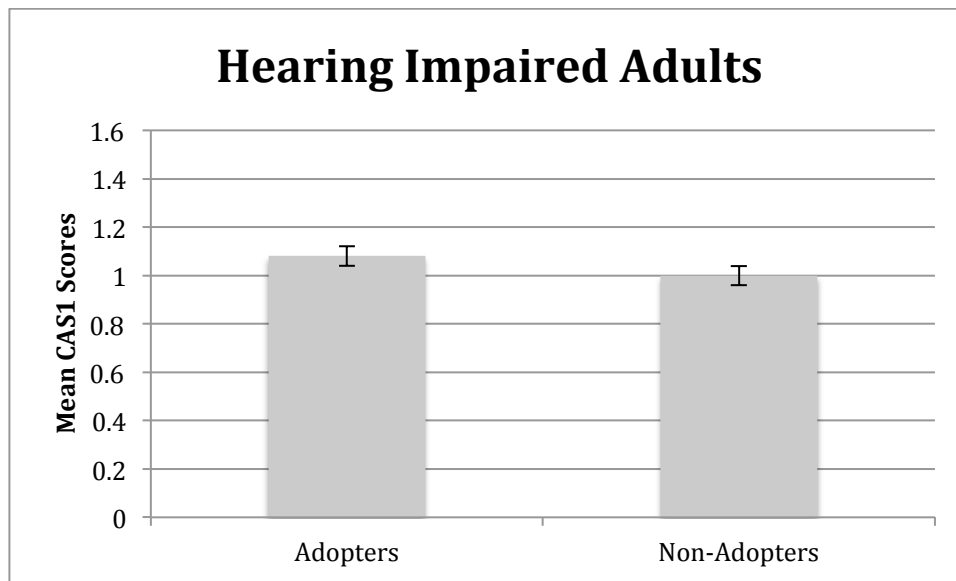


Figure 11. Mean Cognitive Anxiety Scale scores at the initial interview (CAS1) for hearing impaired adults who were adopters and non-adopters.

A Mann-Whitney U test revealed no statistically significant difference in CAS1 scores between HIA adopters and non-adopters ($U = 29$, $p = .541$, $d = .50$). However, there was a moderate effect size that indicated that adopters had a higher CAS score at the first interview than non-adopters.

3.7 Analysis 6: CAS for Adopting and Non-Adopting SO

The following analysis includes all SO of HIA: adopting ($n = 9$) and non-adopting ($n = 8$). It was predicted that there would be a significant difference between adopting SOs CAS1 scores and non-adopting SOs CAS1 scores. The means and standard errors of the CAS scores for SOs of adopting and non-adopting HIA at the initial interview are shown in Figure 12.

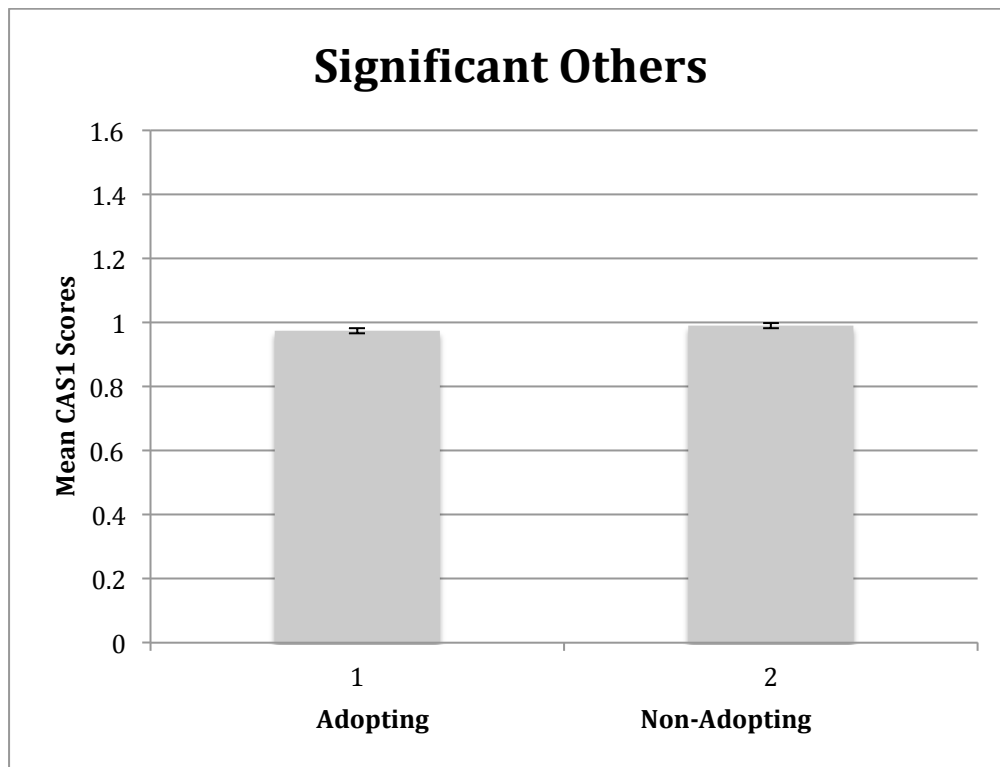


Figure 12. Mean Cognitive Anxiety Scale scores at the initial interview (CAS1) for Significant Others (SOs) of hearing impaired adults who were adopters and non-adopters.

A Mann-Whitney U test revealed no statistically significant difference in CAS1 scores between SOs of adopters and non-adopters ($U = 35.00$, $p = .923$, $d = .057$). The effect size indicated that there was little difference between the CAS1 scores of SOs of adopting and non-adopting HIA.

4 Discussion

The main purpose of this study was to describe differences in cognitive anxiety levels between first time hearing aid users and their significant others before, during and after hearing aid fitting. Overall, 34 individuals participated in this study, 17 of which had a hearing impairment and never had hearing aids before in addition to 17 significant others. Three interviews were conducted with each adopting participant and their significant other. The remaining participants in the non-adopting group were interviewed only once before the initial full diagnostic hearing assessment. Nine out of the 17 hearing impaired participants chose to adopt hearing aids, leaving eight non-adopters. The following research questions have been addressed:

1. (a) Do cognitive anxiety levels change in individuals with hearing impairment as they go through the consultation process?
(b) Is there any difference in cognitive anxiety levels between male and female participants with hearing impairment as they go through the consultation process?
2. (a) Do cognitive anxiety levels change in normal hearing significant others of individuals with hearing impairment as they go through the consultation process?
(b) Is there any difference in cognitive anxiety levels between male and female significant others as they go through the consultation process?
3. (a) Do cognitive anxiety levels differ between participants with hearing impairment who adopt amplification and those who do not?
(b) Do cognitive anxiety levels of significant others differ between participants with hearing impairment who adopt amplification and those who do not?

As mentioned earlier the entire study hypotheses were carried out on a small sample. This, coupled with the non-Gaussian distribution and the use of non-parametric statistics

resulted in statistical analyses that were underpowered. However, in this section special attention will be paid to the effect sizes for all analysis and recommendations will be made in each section on how data collection and recruitment could have been done better or differently. The Cognitive Anxiety Scale (CAS; Viney & Westbrook, 1976) was used to assess each participant's ability to meaningfully integrate the experience of hearing problems.

4.1 Analysis 1: CAS Scores for Hearing Impaired Adults

HIA were predicted to experience greater levels of CA at the first interview (CAS1) than at the second interview (CAS2) and third interview (CAS3). Additionally, it was hypothesized that HIA will experience significantly greater levels of CA at the second interview (CAS2) than at the third interview (CAS3). Results only partially supported this hypothesis. A significant decrease in CA levels was found in adopting HIA between the first interview compared to the third interview and between the second interview compared to the third interview. However, no significant difference in CAS scores were found between the first interview and the second interview.

This overall decrease in CAS levels is supported by past research. Kelly (2011; in review) illustrated that CA changes throughout the consultation process for older adults. Results of her studies indicate that CA was greatest at initial evaluation and the least at 6-month post-fitting which is consistent with what was found in this study. Kelly et al. (2011) revealed in their study that one group of consulters (C1) had higher CA levels at initial consultation compared to another group of consulters (C2) which had less CA, measured 30 days after the initial consultation. The C2 group already completed the consultation process 30 days after their initial consultation, decided to adopt hearing aids and therefore already started the rehabilitation process. C1 could be compared to the first interview and C2 could be compared to the third interview in this current study. Comparing the means between the Kelly et al. (2011) study and this study it can be observed that they are very similar, C1

Mean = 1.01 compared to CAS1 Mean = 1.02, C2 Mean = 0.53 compared to CAS3 Mean = 0.72. However, it has to be acknowledged that all HIA who adopted hearing aids in this study were interviewed three times, thus, the same participants were compared to each other, whereas Kelly et al. (2011) used two different groups and compared them against each other.

It has to be noted that an effect size of $d = .12$, given by Cohen's d , was observed between the first and second interview. An effect size is a measure of the strength between two variables in a statistical population and refers to the magnitude of the results (Lipsey, 1990). An effect size calculated from data is a descriptive statistic that conveys the estimated magnitude of a relationship without making any statement about whether the apparent relationship in the data reflects a true relationship in the population (Lipsey, 1990). In that way, effect sizes complement inferential statistics such as p -values. Cohen's d is calculated by dividing the mean difference between the two groups by the standard deviation for the data. A larger effect size generally means a greater chance of identifying a significant difference between two groups, along with greater statistical power (Lipsey, 1990). As mention earlier, the non-significant finding between the first and second interview had a relatively small effect size ($d = .12$), indicating there was likely not much difference in CA between the first and second interview. Therefore, it is possible that within a New Zealand population CA levels of HIA do not change during the hearing aid fitting process and reduce only after HIA decided to adopt hearing aids.

There are several possible reasons as to why a significant result was not obtained between the first and the second interview. Firstly, CA levels could be low to begin with. This could be due to the fact that all HIA had a free hearing screening at some point during their life. This in turn could reduce the amount of CA at their first consultation because people already know what to expect. They might have been already told that they have a HI and therefore would not experience as much anxiety compared to someone who never had a

hearing screening before. Most of the research conducted comes from the United States of America (USA) where the health system is significantly different compared to New Zealand. Hearing screenings available to individuals in the United States are typically conducted on a pass/refer basis and are not typically accompanied by any counselling or detailed explanation of the test results. Therefore most people who are seen by the audiologist are true first time consulters. In New Zealand it has become the norm to get a free hearing screening which includes air conduction threshold estimations and explanation of the findings at most audiology clinics throughout New Zealand.

Furthermore, individuals especially in Christchurch had a lot to deal with in the last two years. The earthquake events of 2010 and 2011 have changed people and changed their perspectives on life. Everybody who was interviewed in this study talked about the earthquakes and how they have affected them and their families. This of course was not calculated into the CAS score, however, it certainly could have an impact in the way that many individuals may experience cognitive anxiety because they have so many other things to worry about. Thus, looking at the scale of things, HI is possibly on the lower end of most important things in their lives at the moment.

4.2 Analysis 2: Gender differences in CAS scores for Hearing Impaired Adults

It was predicted that there would not be a significant difference between female and male HIA CAS scores at any interview time. Results supported this hypothesis. However, the analyses were underpowered and may simply have been unable to detect a significant difference between male and female HIAs. For HIA, there was no statistically significant difference between female and male CAS scores at first interview with an effect size of $d = 0.756$. Similarly, there was no statistically significant difference between female and male

HIA CAS scores at the second interview, $d = 2.45$, and no statistically significant difference between female and male HIA CAS scores at the third, $d = 1.06$.

Interestingly, one important point to note is that although a significant difference was not found between the genders, effect sizes ranged from .756 to 2.45. Recall, the effect size refers to the magnitude of the result (Lipsey, 1990). As mentioned earlier on, a larger effect size generally means a greater chance of identifying a significant difference between two groups (Lipsey, 1990). Thus, observed effect sizes in this section can be seen as large and results could be titled as ‘inconclusive’ rather than not significant. The large effect sizes suggest there is a measurable difference between gender groups, however statistical significance could not be reached due to the small sample and the use of non-parametric statistics, which in turn decreased statistical power. It is possible that with a larger sample size, the use of parametric statistics, and therefore more statistical power, a significant result could be reached.

As seen above the Cohen’s d effect sizes indicate that while statistical significance was not reached, there may be a clinically significant effect of gender on CAS scores for HIA. Gender differences in CA have not yet been investigated in the hearing impaired population. Thus, these results cannot be compared to previous research in this area. However, gender effects have been reported in the hearing impaired population in regards to how a HI can effect HIA. Tambs (2004) observed that men were more effected by HI than women. He contemplates that this gender difference could be due to career expectations for men. For example, due to the HI, men could experience stronger feelings of being disabled at work, and maybe even the thought of not being able to provide for his family the same way he has done in the past, could produce lower self esteem and more depression symptoms overall. However, in contrast, other studies have found that women place a greater importance on social communication than men and in turn maybe more affected by HI

(Erdman & Demorest, 1998). Controversy, studies by Andersson and Green (1995), Hallberg et al. (2008) and Nachtegaal et al. (2009) have not discovered such gender differences.

A gender difference in general anxiety has been widely reported. Such research suggests that women experience more anxiety than men (Brenes, 2006; McLean et al., 2011; Wells et al., 2006), particularly in the older population (Beekman et al., 1998; de Beurs et al., 2000; Mehta et al., 2003). One reason for the apparent gender difference is gender roles. It has to be noted that data collection in general anxiety research is conducted via self-report measures. Women in general admit more to feelings of fear and anxiety, while men are less willing to talk of such feelings (Bekker & van Mens-Verhulst, 2007; McLean & Anderson, 2009). Hence, this can create a bias in data collected and can affect the results of self-report measures. The CAS, which was used in this study, however, does not rely on self-report of feelings. Thus, it is possible that for CA, there is indeed no significant difference between genders, even with increased statistical power. Future research with a larger sample size is needed to investigate this area and determine whether there is, or is not, a gender difference in CA.

4.3 Analysis 3: CAS Scores for Significant Others

SOs were predicted to experience greater levels of cognitive anxiety at the initial interview (CAS1) than at the second interview (CAS2) and third interview (CAS3) and to experience significantly greater levels of cognitive anxiety at the second interview (CAS2) than at the third interview (CAS3). Results partially supported this hypothesis. For SOs, there was no statistically significant difference between CAS1 scores compared with CAS2 scores ($d = .63$), nor compared with CAS3 scores ($d = .31$). However, CAS scores were significantly higher at CAS2 compared to CAS3 scores ($d = .98$).

Interestingly, even though results were not significant, we can observe an increase of CA levels between the first and the second interview with an effect size of .63. This effect

size indicates a measurable difference between the two variables. Therefore, it is possible that with a larger sample size, use of parametric statistics, and therefore more statistical power, a significant result would be reached.

Overall, CA levels in SOs were highest on the second interview (second follow up appointment with audiologist) but then decreased significantly on the third interview, but reverted to the level of the initial interview. So unlike the HIA, SO did not have different CAS scores from the start to the finish (as evidenced by the small effect size $d = .31$).

Examining each group individually, SOs and HIA, one can observe a difference in trend between them. It can be observed that SOs seem to experience CA in a different way than HIA do. Overall, CA levels for SOs start out lower compared to HIA but then increase on the second interview and in the end stay higher compared to HIA. On the other hand, HIA scores were slightly higher compared to their SOs on the initial first interview but then decrease during the consultation process and in the end stayed lower compare to their SO CA levels.

Past research has examined the difference between HIA and SOs in a similar way. An unpublished study by Kelly (2005) indicated that CA levels of SOs in consulting and non-consulting groups exhibited greater levels of CA compared to HIA. Viney and Westbrook (1976) suggest that CAS scores can vary as a function of the extend to how individuals experiences are successfully anticipated and integrated into their construct system. Therefore, it could be suggested that HIAs were able to more successfully anticipate and integrate the experience of living with HI than were their SOs and therefore exhibited less CA. Many SOs demonstrated CA by expressing speculation about their partner's experience. Thus, it could be said that because SOs exhibited normal hearing they did not have the framework to understand their partner's experiences and were not able to fully integrate the experience of living with HI because they themselves were not experiencing it. Therefore, they could only speculate about their partners' experiences and thus exhibited greater CA levels. The second

interview has shown to incite more CA in SOs. A common theme on all of the second interviews was, ‘I think she is doing well’; ‘I am not sure’; ‘I do not know’; ‘I think it makes a difference.’ These examples illustrate the common theme of speculation found throughout the transcripts of SOs. In summary, because they themselves did not exhibit any HI they could not understand their partners’ experiences and hence were not able to integrate that experience into their every day life.

The CAS used in this study is a direct measure on the effect a HI has on the SO, i.e., third party disability. That is, although the SOs do not have the health condition of HI, they may experience impairments, activity limitations and participation restrictions as a result of the health condition of their hearing impaired partners. The WHO described this phenomenon as ‘third-party disability’ (World Health Organization, 2001). Of particular relevance to third-party hearing disability is the acknowledgement of the client’s social context and relationships which is a characteristic of family-centered care, where the needs of family are recognised in any form of care provided (Hughes et al., 2008). Family-centered care is perhaps the most relevant part considering third-party disability as it emphasises the importance of partnerships which are mutually beneficial to both health care professionals, clients, and families. Although the term “family-centered” has primarily been used within paediatrics, it is seen as applicable to all patient groups in any healthcare setting (Hughes et al., 2008). Its application to third-party disability is particularly relevant as it considers both the client and the family as central to therapeutic decision making and clinical practice. Importantly, a family-centered care approach to audiological rehabilitation ensures that services are planned around the entire family, not just the individual client, with the whole family being recognised as receivers of care (Shields, Pratt, & Hunter, 2006). The application of family-centered care to older couples may be especially important as older couples may be more likely to be co-dependent and operate as a unit.

Results of this study indicate that SOs CAS scores are highest on the second interview which is also the second follow up with the audiologist. As discussed earlier, SOs may not be able to integrate the experiences as much as the HIA does and therefore special attention should be given to the SO on this appointment. This has immediate clinical applications on how the SO should be involved in the fitting process. Recall, that Hétu, Jones and Getty (1993) argued that a two-sided analysis is needed to investigate and examine the perception of difficulties encountered by both communication partners. Therefore using a information model such as seen in figure 13, could involve the SO more in the process, thus SOs can integrate information more meaningfully and therefore a reduction of CA could be achieved.

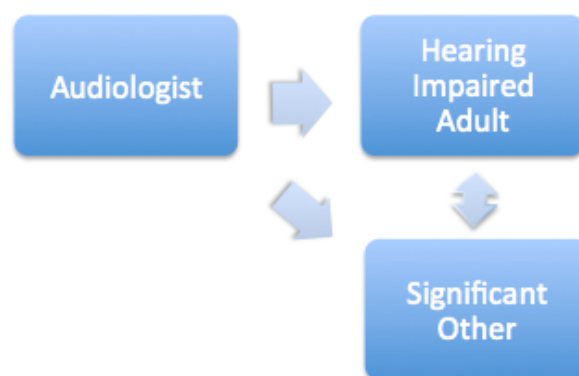


Figure 13. Proposed information pathway including the significant other in the rehabilitation process

4.4 Analysis 4: Gender differences in CAS scores for Significant Others

It was predicted that there would not be a significant difference between female and male SOs CAS scores at any interview time. Results support this hypothesis. However, an examination of the effect sizes indicates the analyses were underpowered. For SOs, there was no statistically significant difference between female and male CAS scores at first interview with an effect size of $d = .756$ (CAS1). Similarly, there was no statistically significant difference between female and male SO CAS scores at the second interview (CAS2), $d =$

.647, and no statistically significant difference between female and male SO CAS scores at the third interview (CAS3), $d = .175$. However, the Cohen's d effect sizes indicate that while statistical significance was not reached, there may be a clinically significant effect of gender at CAS1 and CAS2 but not at CAS3. Thus, the results here could be called 'inconclusive' rather than not significant. Medium to large effect sizes at CAS1 and CAS2 were observed which suggests there is a measurable difference between female and male SOs, however statistical significance could not be reached due to the small sample and use of non-parametric statistics, and consequently, decreased statistical power. It is possible that with a greater sample size, use of parametric statistics, and therefore more statistical power, a significant result would be reached.

4.5 Analysis 5: CAS scores for Adopting and Non-Adopting Hearing Impaired Adults

It was predicted that there would be a significant difference between CAS1 scores for adopting HIA and CAS1 scores for non-adopting HIA. Results revealed no statistically significant difference in CAS1 scores between HIA adopters and non-adopters. However, again, a moderate effect size of $d = .50$ could be observed indicating that this analysis was underpowered. The moderate effect size suggests that adopters had a higher CAS1 score than non-adopters. It is possible that with a greater sample size, use of parametric statistics, and therefore more statistical power, a significant result would be reached.

Another possible reason for this non-significant result could be the time difference between each adopter. Recall, that the time between the first and second interview ranged from 18-166 days. With a greater sample size the distinction could have been made between participants who decided to go ahead to trial hearing aids immediately following the initial consultation appointment and those who wanted to wait to make their decision. This would have made the study more controlled and a Gaussian distribution might have been possible.

Previous research has suggested that those who adopted hearing aids exhibited higher levels of CA compared to those who do not adopt hearing aids. There are several possible reasons for this finding. Firstly, it is possible that CA is one of the reasons why people seek services from an audiologist. In support of this view, Kelly et al. (2011) found that HIA who were consulting for the first time displayed significantly higher CA scores than those who were not yet seeking services for their hearing. Therefore, the presence of CA may add to the impact of the HI, further prompting the individual to seek help and potentially adopt hearing aids.

Furthermore, Hogan et al. (2012) found that hearing aid adopters experience greater difficulty in one-to-one conversations and group situations and a decreased ability to understand speech-in-noise (Robertson et al., 2012). Kelly and colleagues (2011) stated that those who were actively seeking consultation displayed the highest level of CA and those who had received consultation and assistance the least. They suggested that CA can occur when a hearing impaired individual is unable to predict when a communication breakdown will occur due to what is being missed in a conversation. Hence, the finding that hearing aid adopters experience greater levels of CA connects well to the literature. Those who go on to adopt hearing aids are likely to experience difficulties in conversational situations, particularly noisy situations, and therefore are likely to experience more CA.

4.6 Analysis 6: CAS scores for Adopting and Non-Adopting SOs

It was predicted that there would be a significant difference between adopting SOs CAS1 scores and non-adopting CAS1 scores for SOs. Results revealed no statistically significant difference in CAS1 scores between SO adopters and non-adopters. The effect size ($d = .057$) indicates that there was little difference between the CAS1 scores between adopting and non-adopting SOs. Furthermore, mean differences show similar CA levels at the first interview between adopting and non-adopting SOs, combined with a very small

effect size it is possible that there is actually no difference between levels of CA at first consultation between adopting and non-adopting SOs.

4.7 Audiometric Variables

In both groups, adopter and non-adopter group, individuals with HI tended to have a mild to moderate sensorineural hearing impairment in both ears. However, it has to be acknowledged that the difference in PTA4 was significant between adopters and non-adopters. In contrast, significant others in both groups tended to exhibit normal hearing with a PTA4 of 18.68 dBHL in the adopter group vs. 12.14 dBHL in the non-adopter group. None of the participants in this study exhibited a conductive or mixed hearing impairment.

These findings are supported by past research which indicate that the more severe the HI is i.e., the higher the PTA, the more likely a person is to seek hearing services (Humphrey et al., 1981). This is supported by previous research which has found that hearing aid adoption is related to the degree of HI (Fischer et al., 2011). Garstecki and Erler (1998) found a significant difference in level of HI between *female* adopters and non-adopters only. Recall that level of HI is not the only factor implicated in hearing aid adoption with other variables such as self-perceived hearing handicap (Fischer et al., 2011; Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001), increased activity limitation and participation restrictions (Helvik, Jacobsen, Wennberg, et al., 2006), and less social support (Cox et al., 2005) also involved.

4.8 Activity Limitation and Participation Restriction

Research has found that as the perceived HI increases the more likely individuals are to seek help (Swan & Gatehouse, 1990). Furthermore, Swan and Gatehouse (1990) suggested that it is not the degree of hearing impairment per se that encourages individuals to seek services but rather it is the consequences of the hearing impairment in a daily life situation that makes people seek help. Therefore, the activity limitations experienced by these

individuals may be a motivating factor for them to seek services. Moreover, individuals who demonstrate the same amount of hearing impairment but not the same activity limitation may not share the same motivations to seek services for their hearing problems because the impairment is not affecting them in the same way in their daily life situation i.e., they do not experience the same amount of participation restriction.

As described by the ICF framework (World Health Organization, 2001), the perceptions of a patient's family and friends are environmental factors which influence the impact of a HI on an individual. It may be useful for the audiologist to discuss with the patient their family and friends' perceptions of the HI and HAs if the audiologist is advocating that the individual gets HAs. Additionally, in order to further investigate effects of activity limitation and participation restriction a self-assessment tool could be useful in future research. For example the Communication Profile for the Hearing Impaired (CPHI) could be used to assess activity limitations and participation restrictions in HIA as well as for SO.

4.9 Inclusion of the SO in Audiological Rehabilitation

This thesis has shown that both, HIAs and SOs, may experience significant consequences if one of them has a HI. Clearly, the benefits of audiological rehabilitation therefore extend outwards from the hearing impaired person and encompass SOs and other family members. Recognition and resolution of difficulties within the communication circle may help HIAs and their SOs to proceed successfully into a hearing rehabilitation program (Armero, 2001). Further, as family relationships have the capacity to enhance or detract from the hearing impaired person's potential for rehabilitation (Erber, 1993), the probability for successful rehabilitation is greatly enhanced if there is complete support from the spouse and significant others (Miller, 1983). Information about the effects of HI, such as CAS scores, on the SO may therefore help in the identification and reduction of the negative effects of HI on

the family. Hoover-Steinwart, English, and Hanley (2001) found that inclusion of significant others in discussions pre-hearing aid fitting resulted in improved hearing aid benefit for the person with hearing loss. Stephens (1996) also discussed the importance of acknowledging significant others in his psychosocial approach to hearing rehabilitation, proposing that clinicians should assess the attitude and functioning of the spouse through the use of questionnaires, discussion about the couple's problems, and observing the couple's interaction. He further recommends direct involvement of significant others in decision making and goal setting, both in joint sessions and separately (Stephens, 1996). Gagné (1998) further emphasised the important role that significant others play in audiological rehabilitation, noting that solutions to hearing difficulties encompass not only the person with the hearing impairment, but also his or her significant others, and thus significant others are also candidates for rehabilitation services (Gagné et al., 1995).

5.0 Conclusion

CA is a 'state' anxiety which is experienced by people when they are unable to, or only partially able to, meaningfully interpret and judge the implications of an event (Viney & Westbrook, 1976). The present study examined levels of CA in a sample of first time hearing aid users (hearing impaired adults) and their normal hearing significant others. Specifically, this study investigated the differences in CA levels of HIAs and SOs throughout the consultation process. Furthermore, gender differences were investigated between HIA and SOs in addition to, differences in CA levels between HIA adopters and non-adopters and SOs adopters and non-adopters.

Overall, the study sheds a light on how important it is to include SOs in clinical practice but also in research settings. Results indicate that HIA and SO perceive HI in a different way and experience different degrees of CA throughout the consultations process. Even though results were not significant it can be observed that SOs experienced greater

degrees of CA at the second interview than HIA. This suggests that SOs had more difficulty integrating the experience of HI into their construct system. Thus, a two-sided perspective that allows SOs to share their experience may facilitate the rehabilitation process and therefore help the Audiologist during the course of the hearing aid fitting. However, these results suggest further investigation is warranted.

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Appendix 1

Flow chart:

1. If a client rings to make an appointment for a full diagnostic hearing test please ask if the client has had a hearing aid before.

YES

→ If yes, they cannot be involved in the study.

NO

→ If no, please ask them if they would mind participating in the study, which involves one interview on the day they come in for the full diagnostic hearing test. It only will take about 5 minutes but they will need to bring their significant other with them to the appointment if that is ok.

Other inclusion criteria:

- Aged > 18 years
 - Adult onset hearing impairment
 - Has a significant other who is defined as being in a committed relationship for at least the past year and has normal hearing (or only a mild hearing impairment)
 - The significant other needs to be a spouse and they need to live together most of the time!
2. If they agree to participate please let them know that I will give them a ring in the next few days in order to tell them a bit more about the study + confirm with them the location and time of the interview.
 3. Furthermore, please make a note on the Client Information Sheet and include their Name, Address, Phone number and what time and date they will come to the appointment.

I will be coming in twice a week to get a copy of the information sheet in order to ring each client individually before they attend the appointment.

If you have any further questions please do not hesitate to contact me on **XXX** or email me **XXX**

Appendix 2

101 - 1 Female

Step 1. Transcription

Thanks very much. I do not know what I am going to talk about. Mhhh my health at the moment is pretty good. Mhhhh I am not on any medication ohh very little only for cholesterol mhhh. My hearing problem mhhhh up to last week I thought I had a problem with my hearing I was mhh what do you say. X would ask me something or he be talking I could not sort of understand what he was saying, it sounded like it was all mumble jumble and I have to say 'Ai' 'what did you say'? and mhhh he said I think it is about time you went and had a hearing check. So I guess I though yes it is about time but mhhh I went to the doctor about 3 months ago and I said to him I think I have a problem, he said 'oh no you have not' he says you are just on the borderline, ohhh ok, so yeah that was probably about 3 months ago. So anyhow since then hearing had gotten worse. And I thought so we were passing last week and I come in to make an appointment to have my ears cleaned. So which I did. And the hearing is a lot better. So no, apart from that I am ok. I get around alright at the moment. Do all my house chores. Yeah

Word count: 235

Step 2. Clausing

<i>Criteria for identifying clauses</i>	<i>Examples</i>
Expression of complete thought	"I've had a hearing problem since childhood" "Now I can hear"
Contains noun and verb	"and that would upset me" "as I look back on it"
Contains unique thought	"which is so stupid" "and also in a restaurant"

1. Thanks very much.
2. I don't know what I am going to talk about.
3. Mhhh my health at the moment is pretty good.
4. Mhhhh I'm not on any medication
5. ohh very little only for cholesterol mhhh.
6. My hearing problem
7. mhhhhh up to last week I thought I had a problem with my hearing
8. I was mhh what do you say.
9. X would ask me something
10. or he be talking
11. I couldn't sort of understand what he was saying,
12. it sounded like it was all mumble jumble
13. and I have to say 'Ai' 'what did you say'?
14. and mhhh he said I think it's about time you went and had a hearing check.
15. So I guess I though yes it is about time

16. but mhhh I went to the doctor about 3 months ago and I said to him I think I have a problem,

17. he said 'oh no you haven't' he says you are just on the borderline, ohhh ok,

18. so yeah that was probably about 3 months ago.

19. So anyhow since then hearing had gotten worse.

20. And I thought so we were passing last week and I come in to make an appointment to have my ears cleaned.

21. So which I did.

22. And the hearing is a lot better.

23. So no, apart from that I am ok.

24. I get around alright at the moment.

25. Do all my house chores. Yeah

Step 3. Scoring

Guidelines for scoring clauses

- 1) Score each clause only once.
- 2) When a clause emphasizes another clause, score it separately.
- 3) Score a clause when it indicates *difficulty in comprehension*.
- 4) Score a clause when it implies that experience was *not meaningfully integrated*.
- 5) Score a clause when it implies *little or no experience* with topic.
- 6) Score a clause if it reflects *uncertainty* about topic.
- 7) Score a clause if it implies feelings of *guilt or deception* related to topic.
- 8) Score a clause if it implies *denial* of topic.
- 9) Score a clause if it directly states the individual can *only speculate* about topic.
- 10) Don't score a clause when the speculation is implied or unclear.
- 11) Score a clause when it indicates *surprise that is interpreted as meaning the prediction was inaccurate*.
- 12) Score a clause when it reflects a question that indicates a *lack of understanding*.
- 13) Score a clause when it reflects a question that is *a whole or partial repetition* of the original question.
- 14) Don't score a clause when it is merely requesting information.
- 15) Score a clause when a cognitive response was *not available* or *not in the person's repertoire*.
- 16) Don't score a clause if the response was omitted by choice.
- 17) Don't score a clause if the response refers to forgetting or not remembering.
- 18) Don't score the clause "I don't know what else to say."

1. Thanks very much.

2. I don't know what I am going to talk about.

3. Mhhh my health at the moment is pretty good.

4. Mhhhh I'm not on any medication

5. ohh very little only for cholesterol mhhh.

6. My hearing problem

7. mhhhh up to last week I thought I had a problem with my hearing

8. I was mhh what do you say.

9. X would ask me something

10. or he be talking

11. I couldn't sort of understand what he was saying,
12. it sounded like it was all mumble jumble
13. and I have to say 'Ai' 'what did you say'?
14. and mhhh he said I think it's about time you went and had a hearing check.
15. So I guess I thought yes it is about time
16. but mhhh I went to the doctor about 3 months ago and I said to him I think I have a problem,
17. he said 'oh no you haven't' he says you are just on the borderline, ohhh ok,
18. so yeah that was probably about 3 months ago.
19. So anyhow since then hearing had gotten worse.
20. And I thought so we were passing last week and I come in to make an appointment to have my ears cleaned.
21. So which I did.
22. And the hearing is a lot better.
23. So no, apart from that I am ok.
24. I get around alright at the moment.
25. Do all my house chores. Yeah

Step 4. Weighting

Guidelines:

- 1) When a clause contains emphasis, either by adverb or repetition, an extra point of weighting is applied.
- 2) The subject of the clause determines the weighting.
- 3) If the subject is stated in the first person (e.g., "I felt..."), the weighting is Ca3.
- 4) If the subject is a generalization or another person, the weighting is Cb2.
- 5) The denial of cognitive anxiety is assigned a weight of Cd1 only if it is directly stated.

7. mhhhh up to last week I thought I had a problem with my hearing Ca3

11. I couldn't sort of understand what he was saying, Ca3

15. So I guess I thought yes it is about time Ca3

16. but mhhh I went to the doctor about 3 months ago and I said to him I think I have a problem, Ca3

Step 5. Calculate Cognitive Anxiety Score

$$\sqrt{(F \times W)CF + 1/2CF}$$

F = Frequency: total number of times a particular category is scored

W = Weight: Weight attached to that category

CF = Correction Factor: 100 divided by the total number of words in sample

Words = 235

CF = 100/235 of words = 0.42553191

CAS = 1.0762864

Appendix 3



Information Sheet for Adults with Hearing Impairment

INFORMATION

You are invited to participate as a subject in the research project **“Cognitive anxiety of first-time hearing aid consulters and their significant others before, during and after hearing aid fitting.”**

The aim of this project is to better understand the relationship between a temporary, state anxiety (called “cognitive anxiety”) and adjustment to hearing impairment. In psychology, anxiety has been viewed in many ways. One way of thinking about anxiety is as a *transient state* – something that people experience at various times in their lives. Looking at anxiety as a transient state allows researchers and clinicians to view anxiety as a motivating factor rather than a barrier to seeking services. This study will measure a type of state anxiety, called “cognitive anxiety,” which is drawn from the Personal Construct Theory. Cognitive anxiety occurs whenever a person has difficulty making meaning of their experiences. This is likely to happen when a person begins to notice difficulty with communication.

Your involvement in this project will be to participate in a five-minute interview at the time of your first appointment at the hearing aid clinic. Should you decide to purchase hearing aids, your involvement will also be to participate in another five-minute interview during your hearing aid trial period and a final interview after your hearing aid trial period at the hearing aid clinic.

You have the right to withdraw from the project at any time, including withdrawal of any information you have provided. Withdrawal from participation of this study is without penalty and will in no manner affect any ongoing or future relationships with your hearing aid clinic.

In the interview, you will be asked to talk about your experience living with hearing impairment. There is a risk of feeling distressed as you discuss your experiences. The interviews will be recorded and you will be offered to view the transcript afterwards.

The results of the project may be published, but you may be assured of the complete confidentiality of your data gathered in this investigation: the identity of participants will not be made public without their consent.

To ensure anonymity and confidentiality, your name will not be used on your data files; instead you will be given a participant number. In addition, the consent form will be kept in a locked cabinet in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand. Electronic data (without your identifying information) will be kept on password-protected computers that are stored in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand.

This project is being carried out as a requirement of the Master of Audiology degree at the University of Canterbury by Katrin Wendel under the supervision of Dr. Rebecca Kelly-Campbell, who can be contacted on 64 (3) 364-8327. They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed **and approved** by the University of Canterbury Human Ethics Committee.

Information Sheet for Significant Others of Adults with Hearing Impairment

INFORMATION

You are invited to participate as a subject in the research project **“Cognitive anxiety of first-time hearing aid consulters and their significant others before, during and after hearing aid fitting.”**

The aim of this project is to better understand the relationship between a temporary, state anxiety (called “cognitive anxiety”) and adjustment to hearing impairment. In psychology, anxiety has been viewed in many ways. One way of thinking about anxiety is as a *transient state* – something that people experience at various times in their lives. Looking at anxiety as a transient state allows researchers and clinicians to view anxiety as a motivating factor rather than a barrier to seeking services. This study will measure a type of state anxiety, called “cognitive anxiety,” which is drawn from the Personal Construct Theory. Cognitive anxiety occurs whenever a person has difficulty making meaning of their experiences. This is likely to happen when a person begins to notice difficulty with communication.

Your involvement in this project will be to receive a hearing screening to ensure your hearing is within normal limits. If you have a hearing loss you cannot be a participant in this study. In addition you will participate in a five-minute interview at the time of your significant other’s first appointment at the hearing aid clinic. Should your significant other decide to purchase hearing aids, your involvement will also be to participate in another five-minute interview during the hearing aid trial period and a final interview after the hearing aid trial period.

You have the right to withdraw from the project at any time, including withdrawal of any information you have provided. Withdrawal from participation of this study is without penalty and will in no manner affect any ongoing or future relationships with your hearing aid clinic.

In the interview, you will be asked to talk about your experience living with hearing impairment. There is a risk of feeling distressed as you discuss your experiences. The interviews will be recorded and you will be offered to view the transcript afterwards.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, your name will not be used on your data files; instead you will be given a participant number. In addition, the consent form will be kept in a locked cabinet in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand. Electronic data (without your identifying information) will be kept on password-protected computers that are stored in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand.

This project is being carried out as a requirement of the Master of Audiology degree at the University of Canterbury by Katrin Wendel under the supervision of Dr. Rebecca Kelly-Campbell, who can be contacted on 64 (3) 364-8327. They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed **and approved** by the University of Canterbury Human Ethics Committee.

Appendix 4



Researchers: Katrin Wendel, Rebecca Kelly-Campbell

Contact address: University of Canterbury
Department of Communication Disorders
Private Bag 4800
Christchurch 8140
New Zealand

Date: February 2012

Consent Form

“Cognitive anxiety of first-time hearing aid consulters and their significant others before, during and after hearing aid fitting.”

I have read and understood the description of the above-named project. On this basis, I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

I note that the project has been reviewed **and approved** by the University of Canterbury Human Ethics Committee.

Name: (please print): _____

Signature: _____

Date: _____

Appendix 5



HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2011/109

31 October 2011

Katrin Wendel
Department of Communication Disorders
UNIVERSITY OF CANTERBURY

Dear Katrin

The Human Ethics Committee advises that your research proposal "Cognitive anxiety of first time hearing aid consulters and their significant others before, during and after hearing aid fitting" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 31 October 2011.

Best wishes for your project.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'Michael Grimshaw'.

Michael Grimshaw
Chair
University of Canterbury Human Ethics Committee